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A TYPE OF FOVEO-MACULAR RETINITIS OBSERVED IN THE U. S. NAVY

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This report is an attempt to correlate and evaluate the available data from a type of central retinitis observed in the United States Navy personnel and occurring primarily in the Pacific Area. The study was made at the request of the National Research Council, Sub-Committee of Ophthalmology, with the consent of Ross T. McIntire, Surgeon General of the United States Navy, and the coöperation of Capt. W. W. Hall (MC), U.S.N., of the Research Division, Bureau of Medicine and Surgery.

The data were furnished by the following Navy Medical Officers with the consent of their executive officers:

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Commander J. W. Thompson (MC), U.S.N., U.S. Naval Hospital, Mare Island.

Commander Hugo Lucic (MC), U.S.N.R., U.S. Naval Hospital, San Diego, California.

Lt. Commander David O. Harrington (MC), U.S.N.R., U.S. Naval Hospital, Seattle, Washington.

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Lt. Commander A. W. McAlester, (MC), U.S.N.R., U.S. Naval Hospital, Oakland, California.

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Lt. Commander Bruce Stevens (MC), U.S.N.R., U.S. Naval Hospital, Mare Island, California.

Lt. Commander W. P. McGuire (MC), U.S.N.R., A hospital ship.

Lt. Michael J. Hogan (MC), U.S.N.R., U.S Naval Hospital, Treasure Island, California.

I have had the opportunity of examining some of the cases at the Naval Hospitals at Mare Island, Oakland, and Treasure Island. Lees, Hogan, Borley, and Stevens made it possible for Dr. Aiken to photograph the lesions at the University of California.

On November 10, 1943, it was possible to arrange an evening meeting with Lucic, Borley, McAlester, Lees, Flack, Stevens, Hogan, and Aiken. At that time the report was read, discussed, and altered to its present form.

In May of 1941, Lees, while stationed at Pearl Harbor, was impressed by the number of monocular macular lesions seen in the Navy personnel. The percentage seemed all out of proportion to those seen in civilian practice in a similar age group. Later similar observations were

made at Naval Hospitals along the Pacific Coast as men began to return from the Pacific Combat Area. In the spring of 1943, Flack called the condition to the attention of Dr. Harry Gradle, chairman of the Sub-Committee of Ophthalmology of the National Research Council. It was due to his efforts that this study was made. The following must be considered as a preliminary report based on the data at present available. Various types of macular lesions have been observed. These fall into the following general classification:

(1) Extensive central retinal changes due to contusion
(2) Nontraumatic macular chorioretinitis
(3) Hole in the macula
    (a) traumatic in origin
    (b) solar burns
(4) An unusual type of foveo-macular disease that suggests a cyst or hole in the fovea and that is on a nontraumatic basis

The first three deserve brief comment so that the fourth type may be better understood.

Macular changes due to trauma. In this group are those cases of rupture of the choroid and retina in which extensive damage is done to the macular area. It is the typical large irregular lesion in and around the macular area that follows contusion. The severest cases are those in which there has been orbital injury. These cases have been seen at all the stations and are identical with the contusion injuries reported in the last war.

Nontraumatic macular chorioretinitis. This condition, identical with the various types of lesions seen in civil practice, has been observed a number of times by various observers and does not warrant detailed consideration here.

Hole in the macula. This lesion warrants consideration because it must be excluded from the condition under consideration here.

(a) *Traumatic hole in the macula.* Commotio retinae, or Berlin's edema, often develops immediately after trauma, reaches its height in 24 to 36 hours, and gradually subsides in a period of 3 to 4 days. It occasionally requires as long as eight days to subside and may disappear without leaving any traces. In some instances, however, this is followed by the development of a hole in the macula. The hole appears to be punched out, with perfectly round sharp edges and, what is very striking, reveals in the depths an area of choroiditis with atrophy and pigment proliferation corresponding to the retinal lesion. Stevens saw three such cases of Berlin's edema followed by a hole in the macula; two were noncombat injuries whereas the third was a war injury. Harrington observed one patient with the typical lesion who, in one of the battles of the Aleutians, was blown across the deck by a near miss. Borley and other observers have noted similar cases.

(b) *Hole in the macula due to solar burns.* Cases of typical "eclipse" burns have been noted by most of the aforementioned observers. It is usually associated with the use of the "long glass," a monocular telescope of about 20 times magnification. Two typical histories illustrate this type. Horner reported one instance of a signalman on destroyer duty in the Southwest Pacific who was following an enemy plane with the "long glass" and "followed it into the sun." He noted immediate pain before the eye with resultant loss of vision and the formation of the typical punched-out hole in the macula. Stevens's patient was watching an enemy plane during a battle in the Pacific and followed the plane "through the sun" with the resultant loss of central vision and the production of a hole in the macula. Stevens had another patient who, fol-

lowing a burn in the right eye, switched the glass to the left eye, with a similar effect to that eye. He now has a bilateral typical hole in the macula. Both Horner and Stevens noted that there is no pigment change in the area surrounding the lesion in these cases that are the direct result of solar burns.

Foveo-macular retinitis

The type of central retinitis under discussion here did not fit into any of the aforenamed groups.

Number of cases. It is difficult to estimate the number of cases that have been observed, as men are transferred from one hospital or station to another and are often studied by several observers. Lees, however, states that between May, 1941, and July, 1943, during which time he was stationed at Pearl Harbor and Treasure Island, he saw between 250 to 300 cases. As well as can be determined, approximately 176 cases have been studied in detail in various hospitals as the basis of this report.

Lesion. The pathologic changes are limited to the fovea and the surrounding area. In the early stages there is edema with absence of foveal reflex, which Lees describes as a preretinal wheal. Harrington notes that the fovea has a "smudged-over" appearance. Borley describes the early stage as a small round gray infiltrate at the fovea, that when observed with the binocular ophthalmoscope has a punched-out appearance. Lucic states that at first there is a disturbance of the pigment characterized by a fine granular stippling in the macula. Lees, Lucic, and Hogan emphasize that in the early stages it is difficult to differentiate between these changes and a normal macula. Surrounding the fovea is a "bright circle" of almost 1 disc diameter (Harrington) which becomes a red ring at the end of the fifth or the seventh day (Borley). In a few weeks the area develops a fine dustlike pigment mottling that has been described by most observers as a gray area. Lucic describes the later stage as a minute, vertical, oblique, or horizontal cherry-red line or spot appearing in the fovea, which can be seen only with the aid of special illumination (giant ophthalmoscope). In about 50 percent of the cases (Harrington) a minute hole in the macula appears, involving primarily the fovea, which has the appearance as though due to complete absence of the retina in this area (Borley). Borley and McAlester have emphasized that the lesion is primarily a foveal one. This has been observed by others (Lees, Horner, Stevens, Flack, Lucic, Hogan). Lucic says that the final picture is that of an irregular pink or grayish-pink holelike lesion in the fovea surrounded by an area of heaped-up pigment. This heaping-up of pigment makes the central area appear depressed so that it looks like a hole. In Lucic's opinion the lesion was definitely not a hole. Later in some cases small cystic degenerative lesions appear that give the area a honeycombed appearance, and they may coalesce to form a rather typical hole in the macula (Lees, Borley). Over a period of several months the lesion may become somewhat larger or remain stationary (Lucic). A small hemorrhage was observed in one instance and at times a small cyst may appear surrounded by hemorrhage (Borley). Lees observed that the vessels seemed 15 years older than the age of the patient and that drusen occurred more frequently than one would expect in this age group. Harrington and Borley both had the impression that the vessels were not abnormal.

The typical well-developed lesion, according to personal observation and the available data, seems to be that of a hole or cyst in the fovea surrounded by a gray area, 0.5 to 1 disc diameter in size, the

gray area being due to the presence of fine granular pigment. It is possible that in some instances the piling-up of pigment around the fovea may account for the similitude of a hole. In some cases small multicystic areas of degeneration may appear that give the fovea a honeycombed aspect, and that finally a typical hole in the macula, surrounded by the aforementioned gray area, may develop.

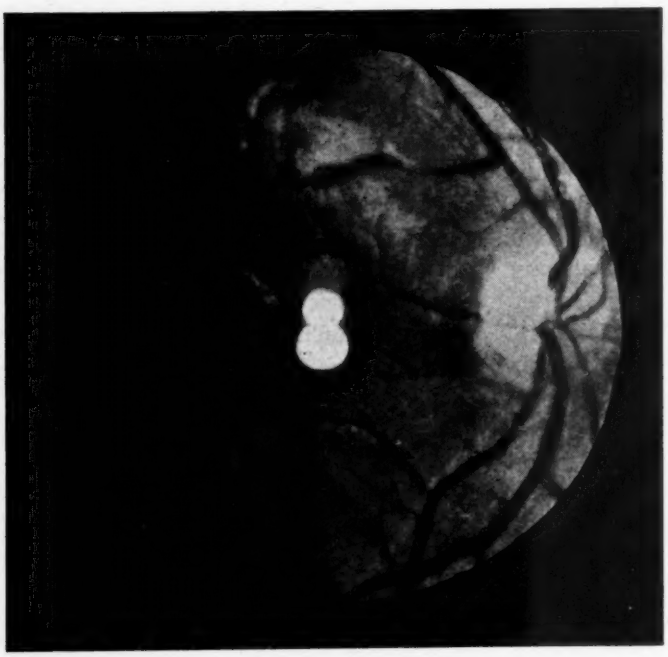

Fig. 1 (Cordes). Small, irregular, holelike or cystlike lesion in the fovea (R.E.).

The remainder of the eye, as studied under the slitlamp, is normal. Pupillary reactions also are normal (Borley, McAlester).

Many cases probably occur without disturbance of visual acuity and go unrecognized, leaving no evidence of the disease (Hogan).

Recurrence has been observed in only one case (Harrington). In this patient the condition cleared with a resultant vision of 20/25. Six months later the patient returned with the typical headache and further loss of vision accompanied by the gradual development of a hole in the macula.

Symptoms. Three investigators (Borley, Harrington, Lucic) have noted that the patients in many of the typical cases had a rather unusual type of headache. Borley noted that they described a pain in the back of the eye usually associated with a "boring" type of headache on the side of the lesion. In some cases this headache persisted three to four months. Pain and headache were increased in bright light or heat. In one of Harrington's cases headache and photophobia reappeared when the patient returned to his work, where he was exposed to the heat and glare of boilers. Harrington also found the headache to be behind the eye, with occasional cases in which the pain was in the eye itself. In all the cases observed by him the headache was bilateral, and frontal or orbital. It was the low frontal or orbital character that he thought typical. Lucic found that 10 percent of his patients complained of a frontal or fronto-temporal headache and that occasionally some complained of dizziness. The retrobulbar pain, however, was present in all of his cases. Photophobia was stressed by Harrington, Borley, McAlester, and Flack. Most of the patients personally interviewed gave the aforedescribed symptoms; there were, however, a few who appeared to have the typical lesion in every way but did not have symptoms of headache. The following description given by a chief machinist's

mate, who had seen duty in the South Atlantic and Caribbean, is typical. The headache, which had developed simultaneously with his loss of vision, was of four months' duration. The pain was frontal or parietal with at times some low occipital involvement and was associated with some pain or aching in the eyeball itself. He stated that the headache was different from any he had ever had and that it was a "sort of dead and warm feeling."

Hogan elicited the headache and pain symptoms behind the eye infrequently in connection with the lesions, and concluded that headache, retrobulbar pain, and the sensation of foreign body were not important and probably not significant.

Vision. Vision during the acute stage varies a great deal depending upon the degree of involvement and has been reported as varying from 5/200 to 20/20 (Borley, Harrington, Flack, Lucic, Horner, Stevens). According to Lees, the average acuity was between 20/25 and 20/30. In some cases the vision returned to 20/20, whereas in others the final vision was as low as 5/200 (eccentric fixation). Borley noted that at times the initial improvement was later followed by further loss. In the patients personally observed, the final vision varied between 10/200 and 20/20+.

Binocular involvement. All the cases seen by Stevens were monocular, whereas Lees, Borley, McAlester, and Harrington reported 25 percent to be binocular. Lucic found 61 percent of his cases to be bilateral. In the 10 unilateral cases the right eye was affected in six and the left eye in four of the patients. In these cases, in most instances, the second eye became involved after the first had healed. In one of Horner's cases the second eye became involved while the patient was in the hospital under observation. The degree of involvement of the second eye varied a great deal.

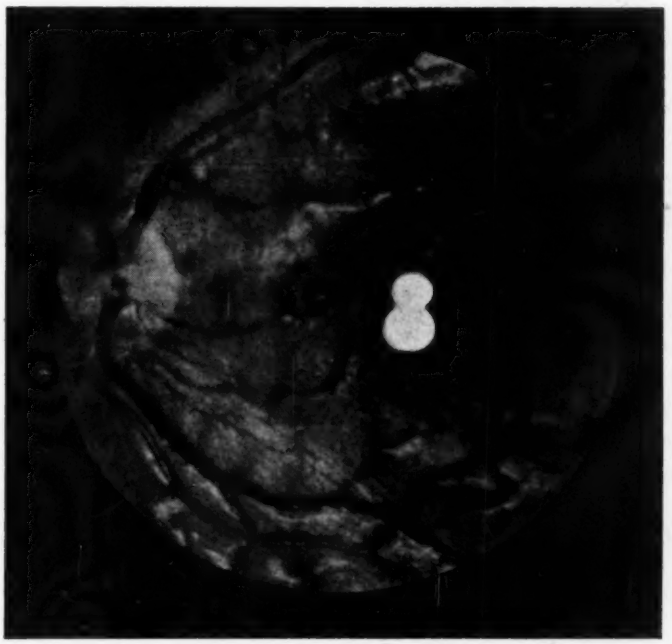

Fig. 2 (Cordes). Foveal lesion similar to that shown in figure 1, and typical as to the size most commonly seen (L.E.).

Perimetric and Screen fields. Perimetric field studies show the changes to be limited to the central area. On the screen the average central scotoma is between 0.5 to 3 degrees (Harrington, Stevens, Borley, Lucic, Lees, Horner). The size of the scotoma does not vary with the size of the test object and is sharply limited. McAlester noted that the scotoma was larger than the foveal area and covered the area of the pigmentary change. This agrees with our findings in some of the cases observed. Harrington noted that in the early stages the scotoma was on the

average 0.5 degree in size. It is also interesting to note that in those cases wherein the vision returned to 20/20 it was impossible to demonstrate a scotoma with 1-mm. test object at 2 meters, even though the "hole" in the fovea remained (Harrington, Hogan). At times the central scotomata were as large as 8 to 10 degrees, with the vision reduced to light perception (Borley).

Age. The average age of the patient in Borley's and McAlester's series was 23 years, whereas in Harrington's patients it was 25 years. The patients in Lucic's group were between 17 and 30 years, with an average age of 21 years.

Occupation. There seems to be no relation between the disease and occupation, for the condition has been observed in men having a variety of occupations; for example in machinists, seamen, signalmen, coxswains, fire-control men, pharmacist's mates, marines, and others. Hogan failed to see the condition in an officer and believed that loss of sleep, fatigue, and subnormal working conditions might be a factor in explaining this discrepancy.

General physical examination. The findings reported are based on the data obtained from approximately 176 cases studied in the various Naval Hospitals. The largest single series is that of Lees who studied 50 cases at Pearl Harbor before the "blitz." All observers agree that no common physical findings were noted in these cases.

All observers found a small percentage of cases with evidence of focal infection such as abscessed teeth, infected tonsils, and sinus disease, but all concluded these findings were merely coincidental.

Genito-urinary examinations also were of no significance. The incidence of gonorrhea was no higher than one would expect. A positive history was obtained in about 11 percent of the cases (Lees, Borley, Harrington). The incidence of lues, based on a positive Wassermann test, was less than 1 percent in most series (Lees, Borley, McAlester, Harrington, Stevens, Horner).

Intradermal tuberculin tests also were insignificant. Lees found the test positive in less than 5 percent of his cases, and Borley in 0.9 percent. Horner found only one positive case and Harrington found none in his series of 16 patients.

Lees performed a histamine-sensitivity test in 12 cases and found it negative in each instance.

Stool examinations made in a number of cases were negative (Borley).

Borley made detailed blood studies in his cases and found eosinophilia of a low degree in 2.5 percent. One patient, returned from Samoa, had an eosinophilia of 8 percent. Tropical diseases, however, are not a factor (Hogan).

Because of the headache present in these cases, Borley did spinal punctures in eight. In six the examination was negative. One patient had a cell count of 13, another a count of 28 cells. In three instances when the spinal fluid was injected into the brain and one eye of a guinea pig a severe uveitis and exudate in the vitreous occurred in 24 hours. Injection of the spinal fluid from the other patients and also control injections were negative. Harrington did a spinal puncture in one case. Examination of the fluid was entirely negative except for a few red cells due to a slightly "bloody tap."

There also seems to be no relation to respiratory or other acute infections (Hogan).

Borley believes that the 5th nerve is also involved; that this accounts for the sensation of foreign bodies that has been described by a fairly large number of patients.

I have just received a personal communication from McGuire, who states that they have seen some of these cases on

a U.S. ship and that physical examination revealed nothing in the way of an etiologic factor.

Area of service. Due to the fact that the vast majority of patients had seen service in the Hawaiian Islands or the Pacific Combat Zone it was thought the disease might, in one way or another, be associated with service in these areas. The disease, however, has been found in patients who have never been in these areas and whose service has been limited to the following places: Alaska (Harrington, Borley); North Atlantic (Harrington, McAlester, Borley); Atlantic and Caribbean (Hogan); California (Lees, Stevens, Borley, Hogan) and within the limits of the United States. One case was seen at St. Mary's Pre-Flight (Borley). Lucic has seen a number of typical cases in "Boot Camp" and at examinations for enlistment. Borley states that after discussing the lesions with the Army Medical Officer at the Presidio (Letterman Hospital) in San Francisco, he is convinced that they have also seen some of these cases.

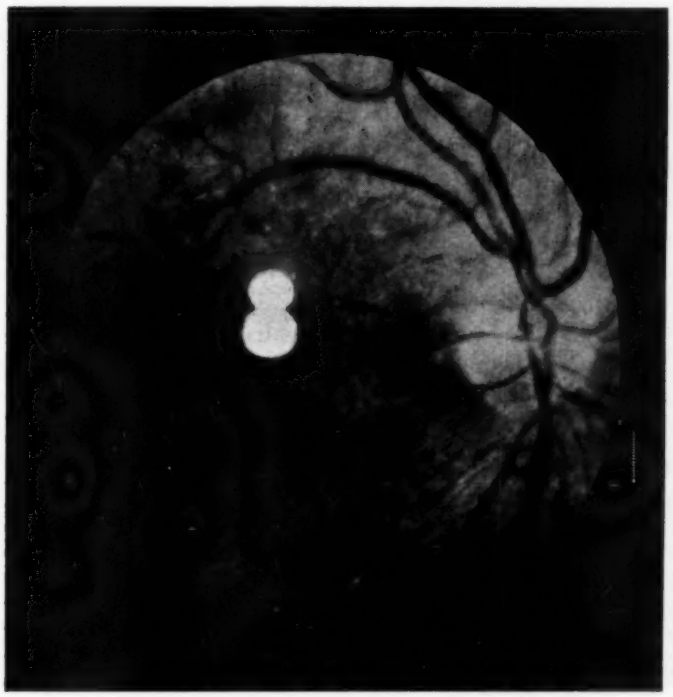

Fig. 3 (Cordes). Lesion larger and more regularly round. This type was seen less frequently by the various observers (R.E., vision 20/20).

Submarine service. The disease has been seen in men who have been in the submarine service (Lees, Borley, Hogan). One patient, interviewed at the Oakland Naval Hospital, stated that during service they saw very little daylight and that he had never taken sunlamp treatment while aboard the submarine.

Etiology. Various possible etiologic factors have been discussed but thus far no conclusive cause has been established.

The patients seen early, and in fact the majority of the patients, have spent some time in the Hawaiian Islands or the Pacific Combat Zone, where there is excessive light and glare. Lees in the beginning considered the possibility of the lesion's being of actinic or solar origin. Many of the patients seen at Pearl Harbor were standing watch, and early in the morning or late in the afternoon were facing into the low sun across the water. Horner believed these cases to be due to excessive light. In addition to the patients who stood watch on the bridge or deck there were others who built gun emplacements or stood patrol duty on bright sand. Horner measured the light about the quarters with a Weston photometer and found it

registered 400 from wood and cement walks and that reflections from the surface of a reservoir of water went as high as 800. He further stated that "at sea when steaming into the sun it might be even worse. On must remember that cloudless skies may be encountered for weeks on end at sea." He further commented on the predominance of blonds in his series. From these statements it is apparent why most observers have given this theory serious consideration. However, the appearance of the disease in submarine crews (Lees, Borley) and in individuals whose service has been limited to Alaska, the North Atlantic, California, and other areas where there is not an abnormal amount of light (Lees, Lucic, Harrington, Stevens, Borley, Hogan) has led in most instances to the discarding of this theory.

That all these patients had one experience in common—that is, their immunization against tetanus and yellow fever—led to the suggestion by some that these inoculations might be a causative factor. Thompson, who was stationed at Mare Island before the Japanese attack on Pearl Harbor, saw a fair number of patients who all came from the Philippines or the Orient. None of this group had received the immunization injections against tetanus or yellow fever. Borley, Harrington, and other observers agree with Thompson that tetanus and yellow-fever immunization can be excluded as a cause.

Emotional upset with vasomotor instability and resultant angiospasm has also received considerable consideration, particularly from Lees, Harrington, and Hogan. Lees, who went through the "blitz" at Pearl Harbor, pointed out that during combat the nervous tension was very great and that, after being through a battle, presence in a combat zone with its resultant danger, produces the same effect. Under these conditions the men smoke excessively. One seaman from a gun crew stated that during battle when a man is given a 5-minute period of relief it is customary to smoke one cigarette after another as rapidly as possible before going back to the station. It is possible to conceive how angiospasm might be produced under these conditions in those individuals who have an unstable vasomotor apparatus. Harrington, in his group of cases, had one patient who suggested vasomotor instability. He was unable to obtain accurate skin temperatures, but the patient had profuse sweating of feet at frequent intervals and at times his hands and feet felt cold. The patient did not smoke, which was also true in one of Lucic's cases. In the remainder of his cases Harrington was unable with the facilities at hand to obtain evidence of vasomotor instability. Hogan believes that angiospasm may explain the lesion. It may be owing to tobacco or other toxic factors. In addition, it may be caused by nervousness, fear, worry, anger, as the result of the stimulation of the secretion of adrenalin. It is also possible that there may be a combination of these factors. Hogan pointed out that many of the men not in combat zone do worry a great deal. Angiospasm would explain the variety of cases coming from different areas, different occupations, and without the history of trauma and infection. The excessive use of tobacco is very common. One patient who was very hypertonic smoked two packages of cigarettes daily. Lees and Harrington, who have also done a good deal of work in this field, concluded that vasomotor instability has not been definitely demonstrated as a cause. In Lucic's opinion worry was not a factor. Hogan, however, believes that there is sufficient evidence to support this theory to warrant further work along these lines. It is interesting to note that an Army surgeon on the Pacific Coast stated that he had seen

a good many cases of vasomotor instability with some actual Berger's disease, the number being all out of proportion to the age group. His patients were definitely affected by smoking.

Lucic believes that heredito-macular disease should receive more consideration than it has. He also noted that all of his patients, with the exception of one, gave a history of looking at arc lights, furnaces, and the like bright objects. This observation was not noted by other observers.

Borley's investigation—namely, the injection of spinal fluid into the eyes of animals with resultant uveitis in some cases—suggests a possibility, but, as he states, it is too early to form any definite conclusions.

As pointed out above, hospitalization and study have failed to reveal a common causative agent in this disease, so that the etiology is still unknown. Angiospasm, however, still warrants consideration.

Pathology. Hogan, who thinks that the disease is definitely on an angiospastic basis, states that, based on clinical observation, the vascular change is probably followed by exudation of fluid into the layers at the edge of the fovea and beneath the limiting membrane of the fovea itself.

The fluid is absorbed quickly, within a week at most. If it occurs within a few days there are minimal changes, with some atrophy of the conducting and supporting elements, but with no real loss of vision, so that vision of 20/20 or 20/20— is present. This, he thinks, is the usual course. If the angiospasm is more prolonged or the edema persists very long, compressing the conducting fibers, secondary degeneration results with lowering of visual acuity. If secondary degeneration occurs, holes are formed and some faint proliferation of the retinal pigment may occur, even with drusen formation.

If there is coagulation or precipitation of the edema fluid (for example, if it is albuminous) small white, sharply defined exudates are seen ophthalmoscopically.

Drusen may be formed secondary to the irritation caused by the edema fluid.

Treatment. All observers agree that therapy has been of little aid and that no specific treatment has been found. The therapeutic measures include fever therapy (typhoid vaccine, and others) vasodilators, calcium gluconate, iodides, thiamine chloride, and large doses of vitamin A in addition to the usual local measures employed in acute fundus disease. Harrington believes that the use of sodium nitrite and large doses of vitamin A up to 200,000 U daily did seem to be beneficial to the patients in some cases especially if they were seen early. Hogan thinks that treatment is unavailing if patients are in the chronic or regressive phase or if permanent damage has resulted. As vasodilators he used nicotinic acid, 25 mg. intravenously, twice daily, followed by hot (110°) foot baths for one-half hour to maintain the dilation. In one instance the lesion cleared within 24 hours following this treatment, whereas a similar lesion in another untreated eye did not subside for a week. Hogan also advised the discontinuance of smoking and sedation.

Prognosis. In general, the prognosis is good; many cases clear with 20/20 vision, even though there are possible gross macular changes. (Hogan, Harrington, Borley, Lees). In some instances, however, the resulting vision may be as low as 5/200 as already pointed out. Lucic, however, made the statement that he had never seen any improvement in any case at any stage. Lees believes that in all these cases there is at least a partial permanent visual disability and that those that clear without demonstrable damage do not belong in this group.

Comments

From the data available certain comments and conclusions seem justifiable. It must be remembered, however, that this is a preliminary report.

That the disease, which was called to our attention by the Medical Officers of the Navy, is not limited to the Navy is borne out by the appearance of the condition in "Boot Camp," enlistment centers, and, in a few instances, in civilian practice.

Due to the fact that the largest number of patients observed had seen service in the Hawaiian Islands or the Pacific Combat Zone, solar retinitis received consideration as a possible diagnosis by most observers. Because of this a short discussion of the effect of our sunlight on the eye seems in order.

According to Duke-Elder[1] light may affect the retina in one of two ways: It may produce an abiotic effect and it may excite the sensation of vision. With the last we are not concerned here. The energy in light not used in the process of vision is absorbed by the retina.

That which reaches the retina in the form of longer waves (infrared and excess visible light) passes through the layers and is absorbed by the pigment layer of the retina, where it is degraded into heat and may produce a thermal lesion. This is evident ophthalmoscopically as a sharply defined and localized red spot accompanied by swelling and edema of the retina, together with congestion of the underlying choroid, and frequently leaving a permanently pigmented scar. This has been discussed by Harman and Macdonald,[2] Würdemann,[3] and others. Probably the most extensive work is that of Verhoeff and Bell,[4] who showed that the effects known as eclipse blindness are wholly thermic and are due to the intense concentration of the solar energy upon the retina by the refractive system of the eye itself, where the evidence of the destructive energy is located.

Clinically the immediate effect, in the milder cases, is a marked scotoma which does not pass away promptly but leaves more or less "serous cloudiness" of vision which may last a few weeks. In the severer cases the scotoma is commonly central and generally of small extent, in a large percentage of cases corresponding fairly well with the dimensions of the sun's image. Wide variations from this may result due to repeated fixations overlapping. Metamorphopsia sometimes appears. In the milder cases, with the lapse of time the scotoma tends to contract, and normal vision is regained within some weeks, whereas in the severer cases the scotoma and loss of vision are permanent. Experimentally Verhoeff and Bell were able to show that the size of the lesion is 3 mm., corresponding in size to the size of the sun's image on the retina. They also give the critical time for development of eclipse blindness as one minute or less. Based on the cases seen in the Navy, the use of the "long glass" apparently very materially shortens the time of exposure necessary to produce eclipse blindness. It seems quite apparent that the lesion under discussion does not belong in this group.

The effect of ultraviolet light upon the retina has received a good deal of consideration. The light energy that reaches the retina in the form of short waves is absorbed by the protein of the cells in its anterior layers. Here it may produce an abiotic effect. Although ultraviolet light produces less-marked action on the retina than on the tissues of the anterior segment, definite pathologic changes characteristic of abiotic action occur. The main changes are a chromatolysis and the formation of oxyphil granules in the ganglion cells and a less-marked chromatolysis in the inner nuclear layer. The majority of the abiotically active rays are absorbed by the lens. The media of

the eye protect the retina very effectively from any marked abiotic effect. In the normal eye the latent period that characterizes abiotic action makes it possible that repeated exposures over many years may eventually cause damage by a cumulative effect. Fuchs[5] and van der Hoeve[6] have presented evidence that senile macular degeneration may have such an etiology. The latter also was able to demonstrate fairly clearly that a cataract is effective in preventing this damage to the retina by deflecting the ultraviolet light. Long excessive exposure to ultraviolet light produces an acute reaction, photophthalmia (snow blindness, electric ophthalmia), but causes no material permanent changes although the immediate reaction may be very severe. Verhoeff and Bell[4] were able to study the condition experimentally in the human eye. The subject was a woman, aged 50 years, who was affected with carcinoma of the upper lid and orbit, necessitating removal of the eye. The eye was normal, the media were clear, and vision was 20/30. The pupil was dilated with atropine, the visual acuity remaining the same. The patient's eye was exposed to very large doses of ultraviolet light for 55 minutes. At the end of the experiment the visual acuity was reduced to counting fingers at 1 foot and erythropsia was present. Within 2½ minutes vision was fingers at 6 feet. After 10 minutes the vision was 20/200, with the appearance of a mist before the eyes but no erythropsia. After three hours, vision was 20/40+. After 22 hours, the vision was 20/30, as before the experiment. Microscopic examination showed the retina to be normal. These investigators conclude that the retina could not have been injured by abiotic action of light because of the rapid return of vision. Siegfried,[7] Berens,[8] and others conclude that the ultraviolet of daylight, even in the higher concentrations, cannot cause permanent retinal damage and that it can be considered relatively harmless for the eye as a whole.

As has been reported, Lucic stated that with one exception all of his patients gave a history of looking at arc lights, furnaces, and so on. I was able to find only one instance in the literature, in a rather limited search, of a case in which apparent damage to the fovea was the result of arc welding. Würdemann[3] reported the case of a 16-year-old girl who stood at a distance of 4 to 6 feet while a workman was welding a shovel with an "electric torch." Ten days later "almost typical" Berlin's edema developed in the macula of the right eye, with radial hemorrhages. Approximately two months after the exposure to the "electric torch" the edema and hemorrhage had become absorbed, leaving a typical hole in the macula without pigment changes in the area surrounding it. There was absence of central vision together with a central scotoma. On the other hand, Rieke,[9] who saw 1,532 cases of welding-arc conjunctivitis in the Kaiser Shipyards between March, 1941, and April, 1943, believes that the welding arc has no effect on the retina. At first there were "frequent repeaters" and even in this group he concluded that exposure to the welding arc had no effect on the retina or deeper structures and caused no permanent damage to the eye.

From the data available at this time another theory of causation that warrants serious consideration is peripheral vascular disease with angiospasm. Hogan points out that, anatomically, the disease occurs almost exclusively in the macular area. This would tend to place the disease on a vascular basis. He further points out that the arterioles from the retinal arteries are terminal at this site and break up into capillaries near the edge of the fovea. This area is particularly susceptible to vascular changes and edema, hence the retinal capillary and arteriolar ar-

rangement must be conducive to lesions of this sort. There may be other portions of the retina affected in this disease—for example, the peripheral terminal arteriolar area elsewhere—but they cause no symptoms and the lesion goes unobserved. Hogan has seen patients who had small round punched-out areas of atrophy elsewhere in the retina without choroid involvement. He saw one patient at Treasure Island with a central lesion who also had another similar healed lesion near the inferior temporal arterioles. Similar observations were made by Flack.

In discussing macular edema Duke-Elder[10] states that circulatory edema is probably due to the structure of the thick fiber layer of Henle, which, with its ability to swell, can absorb large quantities of fluid, a property also shared by the retina around the disc, where the nerve fiber layer is thickest. In addition, the central area is avascular, and the absence of capillaries will limit absorption. Extreme degree of edema in the macular area may lead to the formation of cystic spaces in the retinal substance visible as small flecks. This has been variously described as "cystic macular degeneration," "honeycomb macula," or "vesicular macular edema of Nuel." Later these may form a hole in the macula.

Duke-Elder[10] has discussed the various forms of macular capillary disturbance under the heading of *central serous retinopathy*. This is a peculiar characteristic edema limited to the macular region in young adults. It appears as an annular swelling of a darkish-red color around the macula, usually less but sometimes disc diameter in size. The edema is essentially preretinal, so that the area is raised above the retinal level and is surrounded by a ring-shaped light reflex. There are often also small exudative dots, white to yellow, scattered over it. The condition is transient and the prognosis is relatively good, but if it persists for a longer time, permanent pigmentary and atrophic changes remain, so that although the final vision may be 20/20 careful scotometry may reveal a small central scotoma that is not sufficiently large to become manifest in the usual tests for visual acuity. There may be slight distortion.

A number of observers have believed these cases of central serous retinopathy to be the result of vascular disease, especially angiospasm, but it remained for Horniker[11] to present some cases in which general and special examinations afforded evidence of vasomotor instability. He proposed the name central angiospastic retinitis, but Bailliart[12] called the condition capillaritis. Gifford and Marquardt[13] used the term central angiospastic retinopathy and stressed the absence of inflammatory evidences. It is possible that this disease is identical with the chorioretinitis centralis serosa described by Kitahara[14] and others. It is of interest that one Japanese writer collected 640 cases reported over a five-year period, while another reported 150 personally observed cases.[13] Gifford and Marquardt were also able to demonstrate vasomotor instability in their cases with evidence of peripheral vascular spasm. In their cases the effect of cigarette smoking was often marked. In one case one cigarette caused a drop of peripheral temperature varying from 6.7° to 9°F.

The disease under discussion in this report seems to correspond very closely to the central serous retinopathy of Duke-Elder, although Lees and Harrington think the name central angiospastic retinopathy would seem more applicable if peripheral vascular disease can be demonstrated. While the origin may be toxic, it is recognized that emotional upset caused by worry, fear, and the like, especially when combined with the use of tobacco, may cause angiospasm.

It has been pointed out that in the Service there is ample possibility for

emotional upset. In some of the cases, however, this can be fairly safely excluded. It is acknowledged that many of the men in the Service are excessive smokers, with cigarettes selling for 6 cents a package. In addition, while worrying or under the strain of fear, as has been stated, there is an additional tendency to excessive smoking. This combination in an individual who has an unstable vasomotor system with peripheral vascular disease unquestionably could produce angiospasm. It must be admitted that the above theory will not apply in all of the cases that have been observed. The results obtained with vasodilators when used in the very early stages would further suggest angiospasm as a basis. While this possibility has been considered by several of the Medical Officers, facilities have not been available to carry on conclusive studies in regard to possible peripheral vascular disease.

One further point warrants comment. It is possible that some of the "holes" in the fovea in patients who have normal vision may be explained by Lucic's observation that in some instances the pigment is piled up around the fovea, producing the appearance of a foveal hole.

The failure of the Army to observe the same condition more extensively may possibly be explained by the fact that visual requirements in the Navy are higher than in the Army and therefore any visual defect would be more apparent in the Navy. In a personnel whose visual requirements are not 20/20, many of the milder cases of patients, whose vision did not drop below 20/30, might easily pass unnoticed, especially as it is often difficult to differentiate early changes from a normal macula.

It has also been observed that the disease is a rarity in officers and especially in aviators. These are carefully chosen groups of men. If the angiospasm theory is accepted it seems plausible that vasomotor instability in these individuals would be discovered before they had completed their training and were given responsibility. As has already been pointed out, the percentage of vasomotor instability in the enlisted Army personnel apparently is high for the average age group.

No explanation has been given as to why the disease is so prevalent in the Pacific Area and not in other sectors.

Summary

This summary is based on the data furnished by the various Naval Medical Officers listed above.

The report must be considered a preliminary report.

1. Various types of macular lesions have been observed in Navy personnel. These include extensive central retinal changes due to contusion, nontraumatic macular chorioretinitis, and hole in the macula resulting from trauma or solar burns. In addition to these a rather unusual type of foveo-macular retinitis has been observed which has been found primarily in the personnel that has served in the Hawaiian Islands or the South Pacific Combat Zone.

2. Of the rather large number of cases seen, approximately 176 have been studied in detail in the various Naval hospitals to furnish the data for this report.

3. The lesion is limited primarily to the fovea and starts with a macular edema and loss of foveal reflex. In the early stages the changes are very difficult to differentiate from a normal macula. In the later stages the picture is that of a hole or cyst in the fovea surrounded by a gray area of 0.5 to 1 disc diameter in size and composed of very fine pigment changes. This may progress to a stage where the macula has a "honeycombed" appearance which, in turn, may be followed by the development of a hole in the macula. This is often irregular.

4. Various forms of treatment seem ineffective. The use of vasodilators in very early cases has in a number of cases seemed beneficial.

5. The vision varies between 5/200 and 20/20+ and while most eyes recover with 20/25 to 20/20 vision, in some instances the final vision was 5/200.

6. The average age of the patients was 23 years and the condition was bilateral in 30 percent of the cases. The second eye usually becomes involved after the first has healed.

7. In the typical case there was a central scotoma of 0.5 to 3 degrees. In some instances this disappeared even though the fovea had what appeared to be a hole.

8. Detailed physical examination failed to reveal pathologic changes that were common in any large percentage of the cases.

9. While the vast majority of patients had seen service in the Hawaiian Islands or the South Pacific, cases were also observed in "Boot Camps," enlistment centers, submarine crews, in individuals whose service has been limited to the United States, and a few seen in private practice.

10. Of the many etiologic causes considered, only two deserve serious consideration; namely, solar retinitis and angiospastic retinopathy. The former was rather conclusively ruled out but the latter deserves further consideration.

11. Clinically the disease very closely resembles the picture of central serous retinopathy of Duke Elder, which Gifford has called central angiospastic retinopathy. Because of lack of proper facilities for this special work, it has not been possible to study these cases for the presence of peripheral vascular disease.

12. The survey seems to justify further study as to etiology, giving special consideration to possible peripheral vascular disease and angiospasm.

The report would seem rather definitely to establish an entity that appears clinically to correspond to the central serous retinopathy of Duke-Elder or the central angiospastic retinopathy of Gifford. The cause has not been established. Treatment, on the whole, has been ineffective.

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THE CHOICE OF THE FIXATING EYE IN PARALYTIC AND NONPARALYTIC STRABISMUS*

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Ophthalmic literature contains only occasional and fragmentary statements about the change in fixation as the eyes are directed to different parts of the fields of gaze. Tests for dominancy have generally been made in the primary position for distance and near only, and the changes in fixation in the six cardinal fields have received scant attention. Clinically, this change in fixation is frequently observed in both paralytic and nonparalytic strabismus, and operative procedures should be varied, depending on the choice of fixation.

The dominant eye is said to be the eye with the better vision, but I have observed two cases with vision of 20/200 in one eye, corrected to 20/20 with minus lenses, and 20/20 in the fellow-eye, which was practically emmetropic, yet the myopic eye was chosen to fixate most of the time, either without or with the correction, and the emmetropic eye was used only when distinct vision was necessary.

In nonparalytic convergent strabismus, especially when it is of the convergence-excess variety, several types of fixation are found. Fixation may be performed for distance, for near, and in the six cardinal fields by the eye with the better vision. In such cases the vision of the fellow-eye is below 20/70. These cases are not included in this paper. If the vision in the squinting eye is 20/70 or better, this eye will be found to fixate part of the time in some field, and the better the vision the more often the eye will be found to fixate.

When the vision is equal and the fixation is truly alternating, at least one of three different conditions is found:

First, if either eye fixates without any spasmodic inversion of the fellow-eye, and this whether fixation is in the primary position or in looking to the right or to the left.

Second, if the right eye fixates in the primary position and in eyes right, and the left eye fixates in the primary position but fixates constantly in eyes left. In such cases there is no limitation of outward rotation of either eye, but there is generally a marked increase in inward rotation of the nonfixating eye. In such cases surgical measures applied to the rectus interni to stop the overaction results in a very satisfactory correction. In these cases the convergence near point is usually either normal or excessive.

Third, in this type there may be perfect alternation in the primary position, or nearly so, or one eye may be dominant, whereas the other has a vision of 20/70 or better. In such cases either eye may fixate for distance and near, but the right eye fixates in eyes left and the left eye in eyes right. This results finally in a failure of either eye to abduct normally, and the internal recti rarely, if ever, overact, since they are, in turn, used to fixate while in the nasal field. The convergence near point is often less than normal. Surgical measures to shorten the external recti are indicated, and any surgery applied to the interni depends on the proximity of the convergence near point and the ability to hold this fixation.

The mechanics in this type evidently is as follows: while fixating with the right

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eye in the primary position, the left eye is turned 30° to the right. Instead of moving the right eye 30° to the right, fixation is taken up by the eye that is already in that position. The reverse is true when fixating with the left eye in the primary position with the right eye converged 30°.

In divergent strabismus, the same mechanism prevails if the strabismus is alternating; that is, with the right eye fixating for distance, the left eye is diverged 30° to the left and is used for vision in the left field, but when the left eye fixates in the primary position, the right eye is used for right-field fixation.

The form of surgery and the prognosis after surgical treatment depend on the correctness of the diagnosis, which must include the convergence near point, both as to whether it is absolute or relative and on how strongly the attempt is made and how well it is maintained.

I will not present any theories for the occurrence of these variations, but will state, as simply as possible, the clinical observations that I have made over a period of years.

Fixation in paralytic squints varies in much the same way, with one exception; that is, in very recent cases, where fixation with the paretic eye is uncertain and wavering, the nonparetic eye is more often used to fixate. Later the fixation may change from one eye to the other, or it may, by a tilting or turning of the head or by a control of the convergence, divergence, or sursumvergence, make binocular single vision possible. If binocular single vision cannot be maintained, then secondary contractures and secondary deviations are introduced to make the displacement of the false image either more comitant, or to make it less evident by making its displacement greater. This appears to be true regardless of whether the paralysis is hereditary or congenital or has been acquired only a few weeks or months before the eye is examined for the first time. The contention often heard that in congenital paralyses diplopia is not present, is in most instances, a misstatement if neither eye is amblyopic. Patients will be found to adjust for fusion or for a greater displacement of the images in exactly the same way as they do when the case is recent.

In a paralysis of any extraocular muscle it must be determined which eye fixates for distance, for near, and in the six cardinal fields. These tests will determine the primary and secondary deviations and the secondary contractures, and which of these is the most marked or the most constant. The choice of the fixating eye in paralytic squints and the change from binocular single vision to monocular fixation with diplopia or suppression varies sometimes because of the dominant eye; probably more often because of the failure of the paretic muscle to fixate promptly. When the paretic muscle fixates fairly promptly, this eye is often chosen to fixate to effect a greater separation of the two images.

To illustrate: In a paralysis of the left external rectus, when fixating with the right eye, the primary deviation of the left eye may not be marked, and binocu-single vision is maintained by a turn of the head into the field of the paretic externus muscle. When fixating with the right eye, a secondary contracture of the left medial rectus muscle may occur. The squint is often increased markedly and, because of the force of the internus, one cannot judge accurately the amount of the paralysis. In operating to correct an external-rectus paralysis, the internus should, whenever possible, be engaged on a double-armed suture and severed completely. Often one is able to prove that the lateral rectus is not so paretic as it was believed to be. The surgeon should make this test before asserting that a satisfactory result has been attained from

any form of transplant or other procedure. If fixation is done with the paretic eye, the secondary contracture is negligible, the main deformity being from the secondary deviation of the medial rectus of the fellow-eye.

The same principles are maintained in paralysis of the medial rectus, the greater divergence resulting from the secondary deviation of the lateral rectus of the fellow-eye, when the eye with the paretic medial rectus is chosen to fixate. This, I believe, is the reason for the marked overcorrections of convergent strabismus, when a bilateral recession or tenotomy has been performed.

In a paralysis of the superior rectus muscle, either unilateral or bilateral, if the fixation is out of the field of the paretic superior rectus, there is no secondary deviation of the inferior oblique. Only in those who fixate with the paretic eye in eyes right, and especially in eyes up and right, or in bilateral cases, with the left eye, also in eyes left and eyes up and left, is the spasm of the inferior oblique muscles excessive, and when continued over a longer period, the inferior obliques develop into especially large, powerful muscles.

In paralysis of the inferior oblique, binocular single vision may be maintained throughout a large field, and when the nonparetic eye fixates, the primary deviation may not result in marked hypotropia. When, however, the paretic eye fixates, the secondary deviation of the nonparetic eye is marked.

In a paper read by me in 1941 before the Section of Ophthalmology of the American Medical Association, I attempted to emphasize this difference in cases of double elevator paralysis of one eye. These cases are found in three forms: First, those with binocular single vision, which is maintained by a tilting of the head or by keeping the vision confined to the lower field; second, those in which fixation is maintained by the nonparetic eye, in which case the hypotropia of the paretic eye may be more or less marked; third, those in which the paretic eye fixates. The upward rotation of this eye is more or less limited, depending on the degree of paralysis, but the secondary deviation of the nonparetic eye is excessive. In any of these varieties there may be a true or a false ptosis, the correction of which should be postponed until the eyes have been brought to approximately the same level. Paralysis of the inferior rectus muscle follows the same general rule.

Like the preceding paralyses, paralysis of the superior oblique differs, depending on whether binocular single vision is maintained in some way or whether the paretic or the nonparetic eye is used to fixate. When the nonparetic eye fixates, the inferior oblique muscle of the paretic eye usually has a secondary contracture. In these cases correction consists of performing a tenotomy or recession of the inferior oblique. This may be followed by a tenotomy or recession of the inferior rectus of the fellow-eye, in order to limit any secondary deviation. Wheeler's method of making a tuck in the superior oblique is occasionally useful, and the operation described by Wendell L. Hughes may be of use in such cases. However, when the paretic superior oblique is of the fixating eye, large degrees of deviation may be corrected by making a recession or tenotomy of the inferior rectus of the other eye, in order to stop the secondary deviation. In all of these varieties the form of surgery is dependent on the type of fixation, and surgical success depends on strict adherence to these principles.

This paper should be considered as only a preliminary study, since I have failed to test for dominancy routinely, and, when tested, the results have often not been recorded.

15 Park Avenue.

THE EXOPHTHALMOS OF HYPERTHYROIDISM

A DIFFERENTIATION IN THE MECHANISM, PATHOLOGY, SYMPTOMATOLOGY, AND TREATMENT OF TWO VARIETIES

Part III

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EXOPHTHALMIC OPHTHALMOPLEGIA

Before concluding this lecture, it may be not inappropriate to refer to the condition termed "exophthalmic ophthalmoplegia (Brain, 1938). The term was invented to cover a group of cases in which exophthalmos and loss of eye movement occurred together, sometimes in association with, at others independently of, thyrotoxicosis. The condition was noted to appear spontaneously or after a thyroidectomy, but the former variety was not influenced beneficially by the operation. The characteristic feature of the syndrome was considered to be a paralysis limited to the eye muscles and not possessing the distinctive fatigability of myasthenia gravis nor showing improvement after the administration of prostigmine. The histologic basis was thought to be well recognized, consisting mainly of edema of the orbital contents and an extensive lymphocytic infiltration and fibrosis of the eye muscles.

Criticism arises in connection with the choice of term and integrity of syndrome. Concerning the first item, many varieties of proptosis coupled with disturbance or loss of eye movement occur other than those intended to be included in the term. These range from the pseudo-palsies of orbital neoplasm, inflammation, and vascular turgescence to the ophthalmoplegias of myasthenia gravis and allied neurologic disorders. The expediency of employing a nonspecific term to particularize an individual syndrome may be questioned.

Concerning the basic integrity of exophthalmic ophthalmoplegia, analysis of the illustrative cases reveals that the syndrome comprises examples of loss of eye movement due to thyrotoxic ophthalmoplegia and thyrotrophic exophthalmos. Elsewhere the distinction between the two conditions has been emphasized, the thyrotoxic palsy being a true ophthalmoplegia resulting from a special type of neuromuscular degeneration, whereas the disturbance of eye movement in thyrotrophic exophthalmos is largely mechanical, being due to a swelling and stiffening of the extraocular muscles that take place within the restricted confines of the orbit.

In his opening remarks, Brain draws attention to the presence in the literature of instances of hyperthyroidism associated with ophthalmoplegia. One of these, a case of Warner's (1882), was a woman, aged 25 years, with marked thyrotoxicosis and proptosis and almost total ophthalmoplegia. Autopsy three years later revealed no abnormality of the orbit apart from an increase of interfascicular fat in the voluntary muscles. Gross enlargement, edema, and round-celled infiltration were not noted. Further on, reference is made to Burch's patient in whom the loss of eye movement was accompanied by swelling, edema, and round-celled infiltration of the eye muscles. Both these cases, in spite of pathologic and clinical incongruity, are regarded as instances of one syndrome. Again, later in the article, pathologic details are given of changes in the eye muscles from two patients suffering from exophthalmic ophthalmoplegia. In one (illustrated as fig. 2 in Brain's article), changes typical of thyrotoxicosis are seen; whereas in the other, a case of postoperative progressive exophthalmos,

there is reported enlargement of the muscle fibers and rarefaction of the interstitial tissues due to edema, changes characteristic of thyrotrophic exophthalmos.

Analysis of illustrative cases

It may now be advantageous to examine certain of the accompanying statements:

1. (a) "Neither in exophthalmic goiter nor in exophthalmic ophthalmoplegia is the exophthalmos the result of hyperthyroidism." (b) "In Graves's disease, thyrotoxicosis is an essential; in exophthalmic ophthalmoplegia, it is not." (c) "The exophthalmos of exophthalmic ophthalmoplegia bears no constant relation to the presence of hyperthyroidism."

The object of these remarks appears intended to emphasize the author's opinion that the syndrome of exophthalmic ophthalmoplegia is to be distinguished from Graves's disease and that the development of an eye palsy in the latter condition is not related to the thyrotoxicosis. Such cases were termed "spontaneous" in contradistinction to those which follow a thyroidectomy when the basal metabolism is low. It is overlooked, concerning an instance of Graves's disease (Brain's illustrative case no. 5), that in an earlier publication (Starling *et al.*, 1938) both the exophthalmos and the ocular palsy were noted to improve after thyroidectomy.

As pointed out earlier, the proptosis and loss of eye movement of Graves's disease are essentially thyrotoxic, being somewhat related to the degree of toxicity and improved by the removal of thyroid tissue. The correct designation is thyrotoxic exophthalmos with ophthalmoplegia. On the other hand, the proptosis and loss of eye movement of thyrotrophic exophthalmos is independent of any associated hyperthyroidism.

2. "The syndrome is distinct from myasthenia gravis complicating exophthalmic goiter, points of difference being as follows: (a) The palsy is limited to the eye muscles. (b) The myasthenic fatigability, the relapses, and remissions of myasthenia gravis are not observed. (c) There is no response to prostigmine."

Regarding limitation of the palsy to the eye muscles, it may be recalled that thyrotoxic ophthalmoplegia is not uncommonly associated with palsies of the other cranial nerves. In the earlier publication of the case referred to (Brain's no. 5), the squint was accompanied by bilateral facial and more or less generalized weakness, all items being improved or cured by a thyroidectomy. Myasthenic fatigability was also noted in that the diplopia, before its conversion into a squint, was absent for about half an hour each morning. Concerning the alleged absence of response to prostigmine, it is certain that cases of thyrotoxic ophthalmoplegia do respond to its administration, the amount depending upon the predominance of the myasthenic element over such factors as the degree of degeneration of the eye muscles, their over-lengthening, the retraction of the shortened lid tissues, and the strength of the sympathetic pull.

In thyrotrophic exophthalmos, the loss of movement is probably always limited to the eye muscles because the accompanying hyperthyroidism is seldom severe or prolonged enough to lead to generalized myasthenia. The disturbance of ocular movement also is not a myasthenic property; hence, myasthenic fatigability and response to prostigmine cannot be expected.

3. "The ocular syndrome in exophthalmic goiter is probably due to the action of the thyrotrophic hormone."

At present there is no evidence definitely implicating thyrotrophic activity in the maintenance of exophthalmic goiter, and some not unimportant against the hypothesis. Thyrotrophic exophthalmos occurs both experimentally and in man and possesses features which differentiate it completely from the proptosis of exoph-

thalmic goiter. It is hardly creditable that the thyrotrophic hormone should be responsible for both types of exophthalmos.

4. "The ophthalmoplegia is secondary to the exophthalmos."

The eye palsy in exophthalmic goiter bears no relation to the degree of exophthalmos. Full movement may be retained in the face of a considerable proptosis or, conversely, a palsy may be present with only a slight degree of proptosis. In thyrotrophic exophthalmos, the proptosis and loss of eye movement are both secondary to the muscle changes and not related to each other. The exophthalmos is not ophthalmoplegic nor the ophthalmoplegia exophthalmic.

5. "The ophthalmoplegia is a paresis or paralysis not of individual muscles but of movement in a particular plane . . . the superior rectus . . . is never affected independently of the inferior oblique."

In thyrotoxicosis, any of the individual muscles may be affected by a palsy, either singly or in conjunction with weakness or palsy of some of the others; but the loss of mobility seldom takes place solely in a particular plane. With extreme exophthalmos, ocular movement may be restricted in all directions, owing to general weakness of the eye muscles. In thyrotrophic exophthalmos, upward movement is commonly affected first, usually with upper-lid retraction. If the palsy were in a particular plane, it would be suggestive of a central lesion and the loss of upward movement would more likely be associated with ptosis.

6. "The exophthalmos is always associated with some edema of the loose tissues of the lids . . . and may be considerable."

In thyrotoxicosis, a true edema of the lids is exceedingly rare apart from an associated keratitis. Fullness of the lids not due to edema is fairly common. In thyrotrophic exophthalmos, a slight degree of edema of the conjunctiva in the first stage and obvious edema of the lids in the second stage are usual features.

7. "Bandaging of the eyes often makes the ophthalmoplegia worse."

In exophthalmic goiter, bandaging of the eyes may result in improvement of the extraocular-muscle weakness, as it aids the retraction of muscle fibers. Bandaging in thyrotrophic exophthalmos aggravates the condition, for it increases retrobulbar tension.

8. "Its histologic basis is well recognized."

This is not quite correct. The changes in thyrotrophic exophthalmos, made familiar through the writings of Burch and Naffziger, have little in common with the thyrotoxic degeneration, but the distinction is certainly not well recognized at present.

Conclusion. The term exophthalmic ophthalmoplegia, being of loose definition, possessing no etiologic significance, and relating to a syndrome lacking integral unity, could appropriately be dropped for the more accurate designation of its two components; namely, thyrotoxic ophthalmoplegia and thyrotrophic exophthalmos.

Differential diagnosis

Distinction between the well-developed case of either variety of exophthalmos is simple enough, but difficulty may be experienced in recognizing mild or atypical instances. The differential diagnosis will depend mainly upon the recognition of local characteristics, but an examination of certain general aspects will also be of aid.

Thyrotoxicosis is a disease consisting in the main of two components, thyroid overfunction and sympatheticotonia, both of which contribute in an obvious manner to the symptomatology; but it is not so readily recognized that thyrotrophic hyperthyroidism is of a more straightforward character, being accompanied only rarely by evidence of marked sympa-

thetic disturbance. Thus, the anxiety phenomena of palpitation, variable tachycardia, tremor, sweats, flushes, and anxiety traits all so characteristic of thyrotoxicosis, are usually slight or absent in thyrotrophic hyperthyroidism. Diffuse thyroid enlargement, the concomitant features of loss of weight, lymphoid dysplasia and amenorrhea, frequent associations of toxic goiter and related somewhat to the measure of toxicity, also are not common in thyrotrophism, the thyroid gland often being small and the loss of weight relatively slight. The substance of these remarks is illustrated in patients with acromegaly or in the later phases of pregnancy when the basal metabolism may be raised as much as 40 percent, due to thyrotrophic stimulation in the absence of the slightest suggestion clinically of hyperthyroidism. It may be useful, therefore, to remember that, apart from the proptosis which is capable of differentiation on its own merits, the cardinal features of exophthalmic goiter are often but little in evidence.

Other points of a helpful character concern the age and sex incidence. Thyrotoxicosis is three to four times commoner in women than in men and is mainly a disease of the young adult, although cases occur at all ages from about the third year onward. The peak of its frequency is related neither to puberty nor to the menopause. Thyrotrophic exophthalmos, on the other hand, is three to four times more common in men and possesses a higher age incidence, the average age in 22 cases in men and in 6 in women being 54 and 47 years, respectively. The disease is not often seen under 40 and is rare before 35, although there are two cases in the literature, both strangely enough in women, occurring below this figure, one at 34 years with the loss of one eye (McCravey and Mather, 1940) and the other at 31 years following the gonadothyrotrophic stimulus of pregnancy (Brain, 1939). In general, the disease is a late menopausal manifestation, its incidence probably being related to the increased output of gonadal and less so of thyrotrophic hormones with which that period of life is associated.

Finally, satisfactory evidence of the nature of the hyperthyroid process may be obtained from an examination of the patient's serum for the presence of an increased amount of thyrotrophic hormone. The simplest, and probably most reliable, method of doing this is that practiced by Galli-Mainini (1942) and consists in estimating changes in the basal metabolism of guinea pigs treated with appropriate doses of the serum. A positive result is a sufficient indication of the thyrotrophic nature of the hyperthyroidism, although for various reasons a negative finding does not carry the same weight in the opposite direction.

Concerning the exophthalmos, however, it may be stated that in general a moderate to high degree of symptomless proptosis, often more apparent than real, of resilient character, marked by lid spasm but retaining full eye movement, and with complete absence of local edema or evidence of retrobulbar pressure is most likely to be thyrotoxic in nature; and that a slight to moderate protrusion, often painful and accompanied by other subjective phenomena, associated with retraction of the upper lid not due to spasm, often in conjunction with some loss of elevation and less frequently of lateral movement, early edema, and evidence of increasing retrobulbar pressure, is most probably thyrotrophic in origin.

Conclusion

Concerning the exophthalmos of hyperthyroidism, the existence of a differentiation complete in respect to mechanism, pathology, symptomatology, and response to treatment suggests that two diseases are concerned instead of one, as has been

the accepted opinion heretofore.

The exophthalmos of thyrotoxicosis appears to develop and be maintained independently of hypophyseal control. It often bears some relationship to the severity of the disease and tends to show improvement after thyroidectomy. The thyrotrophic hormone has never been found in increased quantities in the serum of any unquestionable instance.

Thyrotrophic exophthalmos, on the other hand, is undoubtedly of pituitary origin, being certainly associated with increased formation of thyrotrophic hormone and possibly also of one or more sterones. Hyperthyroidism, an essential component of the condition at one stage or other, bears no more than a casual relation to the proptosis. The control of hyperthyroidism by thyroidectomy often leads to severe aggravation of the proptosis on account of the stimulus to increased secretory activity of the pituitary gland.

Thyrotrophic exophthalmos never develops into classical exophthalmic goiter; conversely, the latter is not associated with the progressive thyrotrophic exophthalmos.

Summary

A differentiation based upon distinctions in etiology, mechanism, pathology, symptomatology, and certain aspects of treatment is presented of two varieties of exophthalmos occurring in association with hyperthyroidism. The main features are as follows:

	Thyrotoxic exophthalmos	Thyrotrophic exophthalmos
Etiology		
	A feature of young adult life, the peak being related neither to puberty nor to the menopause.	A feature of the climacteric, the average age in 22 cases in men and 6 in women being 54 and 47 years, respectively.
	Three to four times as common in women.	Three to four times as common in men.
	A disease compounded of hyperthyroidism and sympatheticotonia and maintained apparently independently of thyrotrophic control.	A disease of pituitary origin compounded of thyrotrophism and possibly increased sterone formation. Sympatheticotonia, as in other forms of thyrotrophic hyperthyroidism, is slight or absent.
Mechanism		
	The proptosis is essentially thyrotoxic, being somewhat related to degree of toxicity. A raised basal metabolism is associated.	The proptosis is unrelated to any coincident hyperthyroidism. In postoperative exacerbation, the basal metabolism may be subnormal.
		Unconnected with sympathetic activity. Experimentally, sympathectomy will not retard nor prevent its development. Clinically, the proptosis has appeared in an individual with paralysis of cervical sympathetic.

Produced by traction on the globe of the anterior orbital unstriped musculature operating in presence of weakened voluntary extraocular muscles. Both factors are essentially complementary.

There is no evidence of increased retrobulbar pressure.

Results from increased retrobulbar pressure occasioned by enlargement of extraocular muscles.

Later, the swollen orbital contents bulge against the orbital septum and lids, causing compression of palpebral venous arcades and leading to lid edema and chemosis.

Anatomic basis of mechanism

(a) Müller's palpebral muscles exert a pull on upper and lower poles of globe through connections with expansions from tendons of upper and lower recti muscles to lid tissues. Contraction of these muscles tends to produce lid retraction and proptosis.

(b) Landström's circular muscle, lying in anterior half of orbit and stretching between orbital septum and region of equator of globe, exerts direct concentric pull on globe.

Tension rises rapidly, owing to increasing lid resistance, and vicious circle of pressure leads to disaster unless relieved. Rarely, generalized introrbital edema may be associated with orbital venous obstruction.

Component of sympatheticotonia

Experimentally,

(a) Stimulation of the cervical sympathetic nerve in certain animals leads to lid retraction and proptosis.

(b) Administration of sympathomimetic drugs in subliminal dosage can effect proptosis when combined with thyroxine.

Clinically,

(a) Exophthalmic goiter is invariably accompanied by sympatheticotonia.

(b) The administration singly either of sympathomimetic drugs or of thyroxine will not produce exophthalmos; but the combination of the two substances can effect marked proptosis and lid retraction not accompanied by a dilated pupil.

(c) Cervical sympathectomy may relieve the lid retraction and proptosis.

Component of extraocular myasthenia and hypotonia

Myasthenia is a constant accompaniment of exophthalmic goiter. It varies from the mildest type to a severe degree, simulating myasthenia gravis in its intensity and gravity. Improved by rest and administration of prostigmine, its character is somewhat altered by persistent weakness due to hypotonia.

The muscle weakness is essentially thyrotoxic in origin being cured by a thyroidectomy. It should not be confused with myasthenia gravis nor other types of myasthenia possessing a similar clinical picture.

The eye muscles are affected to a greater extent than are other skeletal muscles; hence, ocular palsies are relatively not infrequent. The predeliction may be accounted for by the fine structure of the muscle fiber which is unique in the body, by their greater susceptibility to chemical and presumably thyroid toxemia, and by widespread degeneration of highly developed nerve supply.

A correlation has been established between the degree of myasthenia and exophthalmos present.

Administration of prostigmine may temporarily reduce the width of the palpebral fissure and improve slightly the degree of proptosis. Thyrotoxic ophthalmoplegias have also been relieved temporarily by this drug.

Alternatively, the administration of yohimbine may reduce the proptosis produced experimentally by the combined effect of ephedrine and thyroxine. Both these drugs favorably influence muscle tone although in different ways.

Orbital pathology	
A neuromuscular degeneration.	Primarily a muscle disorder.
The morbid process is characterized by: (a) General wasting of muscle fibers accompanied by loss of striation, fibrillation, amorphous granulation of sarcoplasm. Marked reduplication of sarcolemmal nuclei and less so those of sarcoplasm.	The morbid process is characterized by: (a) Diffuse and extensive fibrosis. (b) Edema. (c) Special type of degeneration resulting in fibrosis or disintegration and absorption of muscle fibers. (d) Abundant round-celled infiltration.
(b) The nerve fibers show granulation and absorption of neuroplasm accompanied by diffuse proliferation of neurilemmal nuclei.	
Each type of degeneration in scattered areas may lead to disintegration and absorption of respective fibers.	Smaller nerves and vessels affected by edema. The former become absorbed.
Muscles normal in size and consistence.	Muscle enlargement may be gross, sometimes attaining circumference of 60 to 70 mm. Consistence hard and gritty.
Absence of edema, general fibrosis, and round-celled infiltration. A few small lymphorrhages seen.	Absence of sarcolemmal nuclear reduplication.
Lacrimal gland normal.	Lacrimal gland constantly affected by changes similar to those in muscles.
Orbital fat normal or slightly increased.	Orbital fat normal or reduced.
Nutrition of eyeball little impaired; congestion absent, except as result of exposure.	Nutrition of eyeball suffers through congestion, chemosis, and ulceration. Perforation, papilledema, and retinal hemorrhages not infrequent.
Symptomatology	
A symptomless proptosis with features depending mainly on sympathetic overaction and extraocular weakness.	An uneasy proptosis with many features resulting mechanically from increased retrobulbar pressure.
Subjective features absent, as a rule, except when due to complication or exposure.	Subjective phenomena frequent and early, consisting of discomfort or pain, lacrimation, photophobia, diplopia, and difficulty in convergence.
Lid spasm evident.	Lid spasm absent, permitting eversion of lids in early stages.

Proptosis more apparent than real, owing to associated widening of palpebral fissure.	Proptosis more real than apparent owing to absence of lid spasm.
No evidence of increased retrobulbar pressure. The globe can often be pushed back into orbit by firm and gentle pressure although quickly resuming former position on release of pressure.	Retrobulbar tension hard, sometimes stonily resistive. The globe cannot be pushed back into orbit, and attempt is painful.
Congestive features absent except as result of exposure.	Congestive features early and constant, manifested first by subedema of ocular conjunctiva and presence of network of fine venules.
Lid edema and chemosis never seen apart from anasarca or local sepsis due to ulceration.	Lid edema and chemosis consecutive to compression of palpebral venous arcades and lid pressure over cornea.
Ulceration rare and usually of superficial type unless complicated by sepsis.	Ulceration almost inevitable in severe cases; results from corneal necrosis due to lid tension and exposure. It is deep and rapidly perforates unless relieved.
Dislocation of globe not rare in high degrees of proptosis, owing to wide palpebral fissure and laxity of extraocular muscles.	Dislocation of globe almost impossible owing to lid tension and bulk of extraocular muscles.
Eye movement normal but palsies of individual muscles may occur. Ptosis and disturbance of lateral movement most common, but rarely total ophthalmoplegia occurs, usually in association with some generalized myasthenia.	Eye movement affected early, due partly to mechanical hindrance, partly to muscle degeneration. Upward movement disturbed early and most frequently, usually associated with upper-lid retraction. Lateral movement less affected, depression least of all. Total immobility not uncommon.
Eye palsies sometimes relieved by prostigmine and cured by thyroidectomy.	Loss of eye movement not altered by prostigmine, often worse after thyroidectomy.
Vision normal, although slight restriction of extreme temporal fields, owing to weakness of ocular abductors.	May be general constriction of fields due to disc changes. Consecutive optic atrophy may follow.
Lacrimal gland normal.	Lacrimal gland palpably enlarged.
Treatment	
Proptosis improved or not altered by thyroidectomy. Never made worse by op-	Proptosis seldom improved by operation, may be exacerbated due to thyro-

eration. Postoperative progression means insufficient removal of thyroid gland.	trophic stimulation. Experimentally, thyroidectomy facilitates development of thyrotrophic proptosis.
Not altered by iodine administration, made worse by thyroid medication.	Improved by iodine and thyroid administration.
Not affected by pituitary irradiation.	Usually improved by pituitary irradiation.
Tarsorrhaphy useful for ulceration. If sepsis present, tension must be relieved.	Tarsorrhaphy dangerous for ulceration; may hasten loss of eye. Immediate orbital decompression required.

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INCLUSION BLENNORRHEA

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PART I. MANIFESTATIONS IN THE NEWBORN

The clinical manifestations of inclusion blennorrhea of the newborn have been described in a number of reports[1-15] of small series of cases. In view of this fact, agreement concerning the general features of the disease has been surprisingly good. However, further information is needed concerning the sex distribution, seasonal variation, occurrence of lymphadenopathy, manifestations and changes in the chronic phase, and other minor aspects of the disease. Therefore, in order to supply some of these data and in order to establish a basis of comparison for experimental studies to be reported subsequently, the following analyis of another series of cases of inclusion blennorrhea of the newborn is presented.

Incidence. In the six years which have elapsed since Thygeson[13] completed his studies on ophthalmia neonatorum in Iowa, 43 cases of inclusion blennorrhea of the newborn have been observed in the University Hospitals. Seven of these babies were delivered outside the Hospital and were referred for treatment. The other 36 were born in the University Hospitals in the course of 9,580 deliveries, thus giving the disease an incidence of 0.37 percent in the newborn, or an incidence of approximately 10 percent of cases of ophthalmia neonatorum.

The incidence among the two sexes was approximately equal; 23 of the babies were males and 20 were females.

Neither Thygeson[13] nor Julianelle and Lange[14] were able to demonstrate a seasonal variation in the incidence of inclusion blennorrhea. Likewise in this series the distribution was random rather than seasonal (see table 1).

Symptoms appeared simultaneously in both eyes in 30 cases but in 12 cases one eye was involved first and in one case the infection remained confined to one eye.

TABLE 1
SEASONAL INCIDENCE OF INCLUSION BLENNORRHEA

Month	Number of Cases		Number of Deliveries
	Total	Born Univ. Hosp.	
January	4	4	828
February	5	5	765
March	4	3	897
April	4	4	813
May	3	3	828
June	7	6	813
July	4	3	868
August	2	1	812
September	2	1	828
October	4	4	716
November	2	1	696
December	2	1	716
Totals	43	36	9,580

Among the 30 cases in which the onset was bilateral, there were two infants who had obstructed nasolacrimal passages. The obstruction was relieved by irrigation on two consecutive days in one case and on three consecutive days in the other. Three other infants had secondary bacterial infection; in one the microörganism was Streptococcus viridans; in one, Staphylococcus aureus; and in one Neisseria gonorrhoeae. Treatment of the streptococcic and staphylococcic infections with 0.5-percent silver-nitrate oint-

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ment three times a day for four days eliminated the bacteria but apparently had little effect on the course of the inclusion blennorrhea. However, data from these five cases are not included in the statistics on the course of the disease. The case complicated by gonorrheal ophthalmia will be discussed in a subsequent report.*

Incubation period. The incubation period, measured from time of birth to the first appearance of symptoms, varied between 5 and 15 days, with an average of 8 days (table 2). In the 12 cases in which unilateral involvement was followed by symptoms in the other eye, the interval between involvement of the two eyes varied between one and seven days with an average of three days (table 3).

TABLE 2
INCUBATION PERIOD

Onset (days after birth)	Number of Cases
5	3
6	2
7	11
8	14
9	4
10	6
11	1
15	2

Course. (It was impossible to keep the cases under observation during the entire course of the disease but all were observed for several days after the maximum reaction developed and 11 cases were observed at frequent intervals until the conjunctiva returned to normal. In 16 cases the course of the disease was altered by sulfonamide therapy.)†

TABLE 3
INTERVAL BETWEEN INVOLVEMENT OF FIRST AND SECOND EYES

Days	Number of Cases
1	5
2	2
5	2
6	1
7	2

The first sign of the disease, usually, was a small amount of purulent discharge at the inner canthus of one or both eyes. At that time a moderate reddening of the conjunctiva was observed. These signs increased in intensity and were followed by edema of the lids, subconjunctival infiltration, papillary hypertrophy, and preauricular adenopathy. This period of intensification of the manifestations was called the developmental phase. In 26 cases this phase lasted 24 to 36 hours, in 8 it was prolonged, varying between 60 hours and 6 days; but in 9 cases it was short, lasting only a few hours (table 4).

The development of maximum reaction marked the beginning of the acute phase, which was divided into two general groups: moderate and severe. Apparently severity of manifestations in the acute phase was not related to rapidity of onset, for even though the developmental phase in eight cases was gradual, three eventually developed hyperacute manifestations (table 4).

TABLE 4
MODE OF ONSET AND SEVERITY OF SIGNS

Onset	Number of Cases	Manifestation in Acute Phase	
		moderate	severe
Gradual	8	5	3
Rapid	26	15	11
Sudden	9	5	4
Total	43	25	18

The moderate group of the acute phase was characterized by purulent discharge and occasional thin pseudomembranes on the conjunctiva; edema of the lids, particularly of the lower lid; infiltration of

* Part III (to be published later).

† See part III.

the conjunctiva of the lower lid and fornix; papillary hypertrophy; slight chemosis of the conjunctiva, especially of the lower lid and fornix; and preauricular adenopathy in some of the cases (15 in 25). Eversion of the lower lid resulted in exposing a thickened, longitudinally corrugated and bulging lower fornix.

The severe* cases of the acute phase were characterized by the same general manifestations but were more intense. In each case the purulent discharge was profuse, and pseudomembranes 1 to 2 mm. thick were observed on the conjunctiva. Edema of the lids was more extensive and involved the upper as well as the lower lid. Conjunctival chemosis and infiltration extended into the upper fornices. Eversion of either lid resulted in bulging outward of the corresponding infiltrated and corrugated fornix and caused slight bleeding from the conjunctiva. However, the greater amount of pathologic change was in the lower fornix. Preauricular adenopathy was present in each case.

In the acute phase purulent discharge was observed in all cases. Pseudomembranes occurred in 29 cases, being present in all of the severe ones and in 11 of the 25 moderate cases. Edema of the lids and conjunctival infiltration were present in all cases. Preauricular adenopathy was not observed in 10 of the 25 moderate cases but was found in all of the severe cases.

Eleven uncomplicated and untreated cases were followed through their acute phases and at frequent intervals thereafter until the conjunctivas were normal. The acute phase gradually subsided into a chronic phase which, after a much longer time, eventually disappeared, leaving a normal conjunctiva.

The acute phase was considered at an end when edema of the lids and chemosis of the conjunctiva had disappeared. This averaged 21 days with extremes of 14 and 30 days. Pseudomembranes disappeared before the end of the phase. In the moderate cases pseudomembranes were present 2 or 3 days, whereas in the more severe cases they persisted 7 to 12 days and in one case thin pseudomembranes were present as late as on the seventeenth day.

The purulent discharge became less profuse and as the acute phase passed over into the chronic, the discharge changed from purulent to mucopurulent. In one instance discharge persisted for four months, although the average was 60 days and the shortest duration was 25 days. Preauricular lymph nodes were palpable 30 to 38 days, or an average of 32 days. Conjunctival infiltration disappeared from the eyes of two infants in 30 days but persisted for 120 days in another. The average duration was 59 days. Follicles were observed in 9 of the 11 babies between two and three months after onset of the disease. A few follicles were observed in the subconjunctival tissue of the upper lid and fornix, but the majority were located in the lower lid and fornix. Duration of the follicular reaction varied between 2 and 10 months, with an average of 5.5 months.

The total duration of the disease averaged 7 months with extremes of 2 and 12 months.

Complications and Sequelae. During the acute phase the eyes in all cases were examined, with loupe magnification, for corneal complications. In several of the more severe cases, application of fluorescein resulted in a few minute superficial staining areas, but these were transitory and left no opacity. Infiltrates and vascularization were not observed.

Scarring of the conjunctiva did not occur in the 11 cases followed throughout

* Designated hyperacute by Thygeson.

the course of the disease. Nor was it observed in nine other infants of this series examined between 18 and 24 months after birth. Thick pseudomembranes had been present in the acute phase in six of this group.

Laboratory studies. In all cases repeated cultures were made upon blood-agar plates, and in the severe cases upon chocolate-agar and Loeffler's slants. Except in the three cases mentioned, no pathogenic bacteria were grown. In approximately half of the cultures numerous colonies of C. xerosis and in several cultures nonhemolytic colonies of Staphylococcus albus were observed after 24- to 48-hours' incubation. Approximately one half of the cultures revealed no growth of bacteria.

Duplicate secretion smears were made and stained with Giemsa or Wright's stain and by the Hucker modification of the Gram technique. These were found to be of little value except in the three cases complicated by secondary bacterial infection.

Scrapings of the conjunctiva were taken from the lower fornix in all cases and from the upper fornix in approximately half of the cases. The material was smeared upon clean glass slides, fixed overnight in absolute methyl alcohol, and stained for one hour at 37°C. in dilute Giemsa stain. Typical inclusion bodies were found on the slides from the lower fornix of each patient. Similar inclusion bodies were found on the slides prepared from the upper fornix only in those cases exhibiting the severe type of involvement, and in general the number of inclusion bodies was roughly proportional to the severity of the disease. Inclusion bodies were demonstrable from the lower fornix in one case 30 days after onset of the disease, and in another case for 123 days, but, on the average, this time element comprised 66 days.

In addition to epithelial cells, slides made from conjunctival scrapings revealed many polymorphonuclear leucocytes during the acute phase, but as the profuse discharge subsided the absolute and relative number of neutrophiles diminished. Small lymphocytes were present on all slides and their absolute number seemed to remain approximately constant, although they were relatively more numerous as the purulent discharge decreased. Plasma cells were observable during the subacute and chronic phases. Occasional large monocytes were seen during the first few days of symptoms but during the latter part of the acute phase these cells increased in number, and evidence of their macrophagic activity was observed (fig. 1).

Teased and smear preparations were made of some of the thicker pseudomembranes. They were found to consist of many polymorphonuclear leucocytes and a few small lymphocytes caught in a fibrin meshwork. An occasional epithelial cell was seen in the mass but no bacteria were found.

Conjunctival biopsies were made in eight infants, and the pathologic changes reported by Braley[16] in a separate paper, in which he also reported a study of biopsies from the cervix of mothers of six of the infants.

Scrapings of the cervical epithelium of 29 of the mothers, including the six reported by Braley,[16] were examined after preparation with Giemsa stain. Inclusion bodies were demonstrated in 27. In one of the two cases in which inclusion bodies were not found the mother, because of a postpartum infection, had been receiving large doses of sulfanilamide for seven days before the cervical scraping was made.

Differential diagnosis. Gonorrheal oph-

thalmia and staphylococcic conjunctivitis of the newborn are the principal lesions to be differentiated from inclusion blennorrhea.

From the clinical aspect gonorrheal ophthalmia usually begins on or before the fifth day of life; edema involves both lids; chemosis involves the bulbar conjunctiva, the fornices, and the palpebral conjunctiva of both lids; a profuse dirty greenish-yellow discharge usually streams over the lids; and dirty pseudomembranes are frequent. Staphylococcic conjunctivitis may begin any time after birth; edema of the lids usually is less extensive; chemosis usually involves the conjunctiva of the lids and fornices but not of the globe; the profuse discharge is usually pure yellow; and pseudomembranes are white or yellowish white when present. Inclusion blennorrhea usually begins after the fifth day of life; edema of the lids, chemosis and infiltration of the conjunctiva usually are limited to the lower lid and fornix or are more severe there; a profuse pure-yellow discharge flows over the lids; and clean white or grayish white pseudomembranes are frequent.

This clinical differentiation should distinguish the majority of cases but at times laboratory aids are necessary for final differentiation, particularly in instances of the rare mixed infections. However, clinical diagnosis should be confirmed by laboratory methods in every case of conjunctivitis, especially in every case in which gonorrheal ophthalmia must be considered.

In gonorrheal ophthalmia secretion smears and scrapings reveal Gram-negative intracellular diplococci. Cultures from the conjunctiva, made on chocolate-agar plates and incubated under 10-percent carbon-dioxide tension, produce small, clear, or semi-opaque colonies of N. gonorrhoeae after 48 to 60 hours. In staphylococcic conjunctivitis smears and scrapings reveal Gram-positive cocci arranged singly, in pairs, or in small clusters in the secretion or on the surface of cells. Cultures from the conjunctiva made on blood-agar plates and incubated aerobically produce in 24 hours opaque, yellow or white, flat or dome-shaped colonies which are surrounded by a zone of clear hemolysis. In inclusion blennorrhea conjunctival scrapings prepared with Giemsa stain reveal initial body, elementary body, or mixed inclusion bodies in the cytoplasm partially surrounding the nuclei of epithelial cells.

In certain instances and in certain geographical localities a differentiation be-

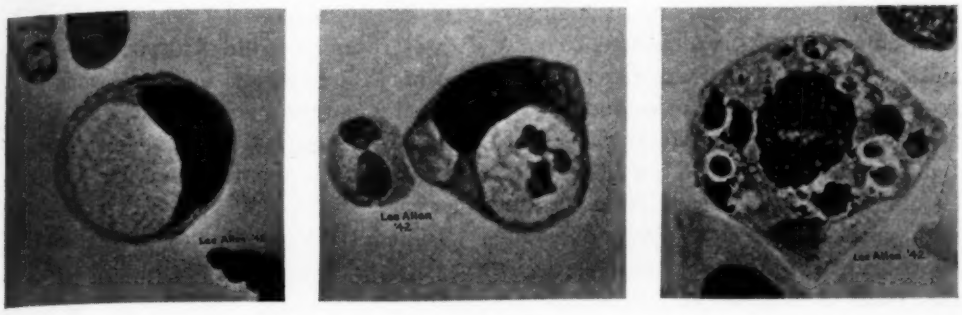

Fig. 1 (Allen). Large mononuclear phagocytes from cases of inclusion blennorrhea of the newborn.

tween inclusion blennorrhea and trachoma may be necessary. In trachoma manifestations are most intense in the upper fornix and upper lid. Corneal infiltrates and pannus formation appear early. In inclusion blennorrhea pathology is maximal in the lower fornix and lower lid. Corneal infiltrates and pannus do not occur.

Discussion. The incidence of inclusion blennorrhea in the newborn seems compatible with previous reports in the literature. However, the sex incidence, 23 males and 20 females, is in contrast with Lumbroso's report[8] of 10 females and 4 males and Julianelle and Lange's report[14] of 15 females and 7 males. This discrepancy should, perhaps, be expected in dealing with small numbers of cases; for example, during the first 12-month period of this study 7 females and 2 males were observed, but during the second 12-month period the ratio was 3 females to 9 males. Therefore, sex distribution probably will parallel the birth rate of the sexes when adequate statistics have been compiled.

The incubation period is similar to that in previously reported series. However, in 12 cases involvement of one eye was followed in one to seven days by involvement of the second eye (table 3). In Thygeson's series[13] the second eye was never involved in less than five days. This he felt was compatible with transfer of infectious material from the first to the second eye. In this series seven cases showed involvement of the second eye one or two days after the first. The only explanation which can be offered in these cases is that the inoculation occurred at the same time but the inoculum for the first eye was larger than that for the second, and, therefore, the incubation period varied by one or two days with the size of the inoculum. For those five cases in which the second eye became involved 5, 6, or 7 days after the first, contamination by infectious material from the first eye seems to be the more logical explanation.

The course of the untreated cases in this series followed the pattern of previous descriptions of the disease. However, the acute phase apparently persisted several days longer than has been reported by all other observers except Lumbroso.[8]

The apparent severity of the disease in its acute phase is out of all proportion to its good prognosis. Each of the seven cases referred to the Hospital for treatment after outside delivery was diagnosed gonorrheal ophthalmia even though the referring physician had failed to find gonococci in smears from the conjunctiva.

The pseudomembranes were removed easily and without leaving bleeding points. However, in the more severe cases in which heavy infiltration of the subconjunctival tissue occurred, only slight manipulation of the lid was required to produce a sanguineous discoloration of the discharge.

Enlargement of the preauricular lymph nodes roughly was proportional to the severity of the conjunctival pathologic change. The enlarged nodes were moderately firm and there was no discoloration of the overlying skin.

Bacteriologic examinations were made several times in each case, but pathogenic bacteria were found in only three cases. In two of these, inclusion bodies persisted in the epithelial cells and the course of the disease was unaffected even though the pathogenic bacteria were eliminated from the conjunctiva. These facts support the contention that inclusion blennorrhea is an infectious disease not of bacterial origin but probably of virus etiology.

Inclusion bodies were found in scrapings from both the upper and lower fornix in severe cases but only in scrapings

from the lower fornix (that is, the site of maximum pathologic change) in the milder cases. This distribution should be remembered particularly when one is attempting to make a diagnosis in mild cases or attempting to determine the presence or absence of inclusion bodies in the evaluation of therapy. This distribution of the inclusion bodies also suggests that they are associated with the etiologic agent of the disease.

The presence of large mononuclear cells showing macrophagic activity (Leber cells) has not been stressed in previous reports. Cells of this type were seen in practically all scraping preparations. They were never very numerous but three to six were found in the average search for inclusion bodies in a scraping preparation.

Two of the infants in the series were the first-born of twin births. In both instances the second twin did not develop inclusion blennorrhea, yet 10 or 11 days after delivery cervical scrapings from the two mothers revealed inclusion bodies.

Summary and Conclusions. In a six-year period 43 cases of inclusion blennorrhea of the newborn were observed. Thirty-six of these occurred in the course of 9,580 consecutive deliveries, thus giving the disease an incidence of 0.37 percent in the newborn. However, this group of cases accounted for approximately 10 percent of ophthalmia neonatorum observed during the six years.

2. In contrast to previous reports incidence in the sexes was approximately equal.

3. There was no apparent seasonal variation in incidence.

4. Culture studies in these cases substantiate the conclusion that the disease is not of bacterial origin.

5. The distribution of inclusion bodies in relation to maximal pathologic change suggests that they are associated with the etiologic agent.

6. The disease was divided into three phases: developmental, acute, and chronic. The developmental phase varied between a few hours and six days. The acute phase averaged 21 days but varied between 14 and 30. The chronic phase persisted for several weeks to several months, thus making the total duration average 7 months with extremes of 2 and 12 months.

7. Transitory, superficial, punctate, epithelial staining of the cornea occurred in several of the severe cases during the acute phase.

8. Corneal infiltrates and vascularization of the cornea did not occur.

9. Folliculosis occurred 2 or 3 months after the onset of the disease in 9 out of 11 cases and lasted 2 to 10 months (average 5.5).

10. Mononuclear macrophages (Leber cells) were observed in scraping preparations. They were more numerous and apparently more active in the latter part of the acute phase.

11. Cervical scrapings, made from mothers of 29 infants in this series, revealed inclusion bodies in 27.

Part II. Manifestations on Consecutive Conjunctival Passage

Lindner has proposed that inclusion blennorrhea and trachoma originally were the same benign disease. He believes the virus of inclusion blennorrhea has remained benign because of its frequent passage through mucosa of the male or female genital tract. On the other hand, he believes that the virus of trachoma has become adapted to the conjunctiva as a result of continuous eye-to-eye transmission, and in its adaptation has changed its disease-producing characteristics and has increased its virulence.

This theory has been contested by

Gebb,[17] Löhlein,[18] Morax,[19] Thygeson,[11] and others on the basis that accidental and experimental inoculations with material containing the infectious agent of inclusion blennorrhea have produced swimming-bath conjunctivitis and no trachoma. However, several of these observations were the result of single inoculations; thus no time was allowed for adaptation of the infectious agent to the conjunctiva and the observations therefore offer an inadequate basis for contesting the theory. Therefore, to test Lindner's hypothesis and to make some other observations, which will be reported later, a series of consecutive conjunctival passages of inclusion blennorrhea have been made.

At the time of this report, 40 consecutive passages have been made. Thirty-five of the subjects were observed until several days after the development of maximal manifestations, then were used for therapeutic studies.* However, five untreated control cases have been observed throughout the entire course of the disease.

Materials and Procedures. Children between three and nine years of age were selected as subjects for the passage studies after examination of their eyes revealed: normal lids, conjunctivas, and corneas; patent nasolacrimal passages; and after cultures of the conjunctivas failed to grow pathogenic bacteria.

Infectious material for the first passage was obtained from a case of inclusion blennorrhea of the newborn without secondary bacterial infection. The infant had developed signs of the disease on the morning of the tenth day of life. Within a few hours the conjunctival manifestations had reached their maximum and were considered moderate (part I). Cultures made on the morning of the tenth day grew several colonies of C. xerosis, but no pathogenic bacteria. Conjunctival scrapings from the infant and cervical scrapings from the mother revealed inclusion bodies. Cultures from the mother's cervix were free from pathogenic bacteria. Scrapings of the conjunctiva made approximately 48 hours after the development of maximal signs were used as the inoculum in the first passage.

The second and subsequent passages were made after the subject of the preceding inoculation had developed maximal manifestations. Direct transfer of infectious material from the conjunctivas of one subject to the next was made by means of conjunctival scrapings. In each case a sterile platinum spatula was drawn over the infected conjunctiva several times in the same manner as is used in obtaining material for microscopic examination. Then the material was deposited upon the normal conjunctivas by gentle massage with the spatula. Immediately after the transfer was made similar scrapings were smeared upon glass slides and prepared for microscopic examination with Giemsa stain. Study of these slides gave a rough index of the relative number of inclusion bodies transferred.

Conjunctival cultures and scrapings were made at 2- to 4-day intervals throughout the period of observation of the 35 cases eventually used for therapeutic studies. In 5 untreated cases laboratory examinations were made at 2- to 4-day intervals for the first 30 days and at weekly intervals thereafter.

Results. Following inoculation each of the 40 subjects developed conjunctival inflammation typical of that which has been described as swimming-bath conjunctivitis or inclusion blennorrhea of the adult. Moderate to profuse purulent dis-

* To be reported as part III.

TABLE 5

INCUBATION PERIOD, ONSET AND ACUTE MANIFESTATIONS OF 40 CONSECUTIVE CONJUNCTIVAL TRANSFERS OF INCLUSION BLENNORRHEA

Passage Number	Incub. Period	Onset	Acute phase	Pseudo-membranes	Discharge	Edema of Lids	Conjunctival Infiltration	Preauricular Adenopathy
I	7	abrupt	moderate	+	+++	+	++	+
II	5	abrupt	moderate	0	+++	+	++	+
III	5	abrupt	moderate	+	+++	+	++	+
IV	12	abrupt	moderate	0	+++	+	++	+
V	10	gradual	moderate	0	+++	+	++	+
VI	5	abrupt	moderate	+	+++	+	++	+
VII	5	abrupt	severe	++	++++	++	+++	++
VIII	5	abrupt	severe	++	++++	+++	+++	++
IX	5	abrupt	severe	++	++++	+++	+++	++
X	12	gradual	moderate	0	+++	+	+	0
XI	7	abrupt	severe	++	++++	++++	+++	++
XII	6	abrupt	moderate	+	+++	++	++	++
XIII	7	abrupt	severe	++	++++	++++	+++	+++
XIV	9	gradual	moderate	0	+++	+	+	0
XV	5	abrupt	moderate	+	+++	++	+	+
XVI	5	abrupt	moderate	+	+++	++	+	+
XVII	6	abrupt	severe	+++	++++	++++	++++	+++
XVIII	7	abrupt	severe	+++	++++	++++	++++	+++
XIX	7	gradual	moderate	+	+++	++	+	+
XX	6	abrupt	severe	++	++++	++++	++++	+++
XXI	4	abrupt	severe	++	++++	++++	++++	+++
XXII	8	abrupt	severe	+++	++++	++++	++++	+++
XXIII	13	abrupt	severe	++	++++	++++	++++	+++
XXIV	8	abrupt	severe	++	++++	++++	++++	+++
XXV	8	abrupt	severe	++	++++	++++	++++	+++
XXVI	15	abrupt	severe	+++	++++	++++	++++	+++
XXVII	5	abrupt	severe	+++	++++	++++	++++	+++
XXVIII	7	abrupt	severe	++	++++	++++	+++	++
XXIX	5	abrupt	severe	+++	++++	++++	+++	++
XXX	12	abrupt	severe	+++	++++	++++	++++	+++
XXXI	7	abrupt	severe	++	++++	++++	+++	+++
XXXII	4	abrupt	severe	++	++++	+++	+++	+++
XXXIII	5	abrupt	severe	++	++++	+++	+++	+++
XXXIV	14	abrupt	severe	++	++++	++++	+++	+++
XXXV	9	abrupt	severe	++	++++	+++	+++	++
XXXVI	11	gradual	moderate	0	+++	++	++	+
XXXVII	11	abrupt	moderate	+	+++	+++	++	+
XXXVIII	8	abrupt	severe	++	++++	++++	+++	++
XXXIX	9	gradual	moderate	0	+++	++	++	+
XL	10	abrupt	moderate	+	+++	++	++	+

charge was accompanied in many cases by false membranes upon the conjunctiva. The lids were edematous; the subconjunctival tissue was infiltrated; and there was some swelling of the conjunctiva. Upon eversion of the lid the conjunctiva of the lower fornix bulged outward and presented the ruga-like appearance characteristic of the mucosa of the rectum. Follicles were present and the preauricular lymph nodes were palpable.

The intensity of these manifestations varied among the 40 cases but in general was considered moderate in 16 cases and severe in 24. The distinction between moderate and severe was the same as described for the newborn (part I).

Incubation period. The time between the inoculation and the appearance of first signs of conjunctival inflammation varied between 4 and 15 days (table 5). The average was 7.7 days, which was practically the same as was found in inclusion blennorrhea of the newborn (8 days, part I).

Onset. The developmental phase was either gradual or abrupt. In 6 cases development of maximal signs required from 2 to 6 days after the appearance of conjunctival discharge and redness, whereas in 34 cases maximal inflammatory signs appeared within a few hours. The nature of the onset was not related to the length of the incubation period, for the 6 cases in which onsets were gradual had incubation periods varying between 7 and 12 days, and the cases manifesting the three longest incubation periods had abrupt onsets.

Course. Because the majority of these cases were used for therapeutic studies (part III) several days after the development of maximal manifestations, the entire course of the disease was followed in only five control cases. These were passage number I, II, XV, XXV, and XXXIII, selected as controls because three were moderate and two were severe.

Following the developmental phase, an acute phase similar to that described for the newborn ensued. However, in the experimental cases follicles appeared during the acute phase. They were observed between the third and fifth days of the disease and in general were seen earlier in the 16 moderate cases than in the 24 severe ones. Pseudomembranes were not observed in seven of the moderate cases, and only thin ones were seen in the remainder, whereas, thin to thick pseudomembranes were observed in all severe cases. Preauricular lymph nodes were not palpable in 2 of the moderate cases but were slightly enlarged in 11 cases and easily palpable in the remaining 27 cases. Edema was present in the lower lids in all cases and extended into the upper lids in the more severe cases. Conjunctival chemosis and infiltration was present in the lower lid and fornix in all cases and extended into the upper lid and upper fornix in the more severe cases.

TABLE 6

DURATION OF SIGNS IN CONTROL CASES

Passage No.	Acute Phase (days)	Pseudo-Memb. (days)	Edema of Lids (days)	Preauricular Adenopathy (days)	Conj. Infiltration (days)	Discharge (days)	Inclusion Bodies (days)	Follicles (months)
I	14	2	14	10	28	29	63	3
II	16	0	16	18	29	32	63	3
XV	19	2	19	21	31	33	63	5
XXV	30	7	30	35	61	70	70	7
XXXIII	26	5	26	31	49	56	63	6
Average	21	3	21	23	39	44	64	5

In the 5 control cases, which were allowed to run their courses without therapeutic interference, the acute phase persisted for 14, 16, and 19 days in the moderate cases and for 26 and 30 days in the severe cases, or an average of 21 days (table 6). Pseudomembranes did not appear in one case but persisted 2 to 7 days in the others. The preauricular lymph nodes were palpable for an average of 23 days and conjunctival infiltration was observed for an average of 39 days. Discharge, profuse at first, diminished toward the end of the acute phase, became mucopurulent, and disappeared after 44 days on the average (table 6).

The duration of the chronic phase and total duration of the disease were determined by the disappearance of follicles. In these 5 cases follicles persisted ap-

proximately 3, 3, 5, 6, and 7 months, respectively, or an average of 5 months.

Symptoms. A sensation of irritation of the eyeball or a foreign-body sensation usually preceded the appearance of discharge by two or three hours, and generally persisted throughout the acute phase. During the period of maximum reaction all of the subjects complained of slight photophobia for three or four days. The lower lids were slightly tender during the acute phase but were never painful. Enlargement of the preauricular lymph nodes was not associated with pain or tenderness. However, the most annoying symptom was the discharge.

Complications. The corneas were examined at frequent intervals by means of the slitlamp and biomicroscope. During the period of maximum reaction eight of the subjects with photophobia were found to have many fine, superficial, grayish-white opacities of the corneal epithelium. After rapid staining with fluorescein, these opacities retained the green color. They were found close to the limbus and were more numerous in the lower portion of the cornea; but they were transitory, never being demonstrable for more than two days. There was no evidence of corneal infiltrates nor of extension of superficial or deep vessels into the cornea, at any time in any of the cases. Conjunctival scarring did not occur.

Laboratory studies. Corynebacteria, with culture characteristics of xerosis, and nonhemolytic colonies of Staphylococcus albus were grown in approximately one half of the conjunctival cultures. However, pathogenic bacteria were cultivated from the inflamed conjunctiva in only four cases. Subject XI became infected with Streptococcus viridans; subject XIII with D. pneumoniae, type viii; subject XVIII with Staphylococcus aureus (hemolytic); and subject XXIV with D. pneumoniae, type vi. In making the transfer from each of these to the subsequent subject, scrapings were made and transferred between 10:00 a.m. and 12:00 m. At 4:00 p.m. of the same day and at 8:00 a.m. of the following day the recipient had one drop of 1-percent aqueous solution of silver nitrate instilled into the conjunctival sac of each eye. A mild chemical conjunctivitis of approximately 30 hours' duration resulted in each of these cases, but subsequent cultures failed to reveal pathogenic bacteria. In these cases cultures were made daily for 10 days and at 2- to 4-day intervals thereafter. The course of the disease apparently was unaffected in these recipients, for the incubation period was 7 days in 3 and 8 days in 1 case. The onset was abrupt and the acute phase was considered severe in all four.

By mistake, recipient XXVI was inoculated before his preinoculation cultures had been incubated 48 hours. The conjunctiva appeared healthy and no growth was observed on the cultures after 24-hours' incubation. The inoculation was made but on the following morning the culture from each eye (after 48-hours' incubation) revealed several small umbilicated colonies surrounded by narrow zones of alpha (green) hemolysis. These bacteria were subsequently identified as D. pneumoniae, type xiv. The positive cultures were discovered approximately 18 hours after the inoculation and immediately treatment with 0.5-percent silver-nitrate ointment was instituted. The ointment was instilled three times a day for three days. Cultures made the morning after treatment was discontinued and throughout the remainder of the course failed to grow pathogenic bacteria. The incubation period in this instance was 15 days, but the

onset was abrupt and manifestations rapidly became severe.

Inclusion bodies were found in Giemsa-stained scrapings prepared from the lower fornix of each case at the onset of disease manifestations, and the relative number of epithelial cells containing inclusion bodies increased for several days. In the five control cases inclusion bodies were demonstrable throughout the acute phase and well into the chronic phase. In 4 cases inclusion bodies were found for 9 weeks after the onset and for 10 weeks in the fifth case (table 6). Scrapings from various locations on the conjunctiva during the acute phase revealed that epithelial cells containing inclusion bodies were more numerous in the region of maximum pathology. The greatest number of inclusion-body-containing cells was always found in the lower fornix; however, inclusion bodies were found in numerous epithelial cells from the upper fornix and upper lid in the more severe cases.

Inflammatory cells found in the scrapings were similar to those observed in inclusion blennorrhea of the newborn: numerous polymorphonuclear leucocytes during the early part of the acute phase; moderate numbers of small lymphocytes throughout all phases; occasional plasma cells; and a few large mononuclear cells which exhibited macrophagic activity. The phagocytic large mononuclear cells (Leber) were never numerous but usually 6 to 10 cells were found in the average scraping made 4 to 6 days after the onset of symptoms.

Discussion. The transfer of conjunctival scrapings from a case of inclusion blennorrhea of the newborn (acute phase) to the normal conjunctiva of a six-year-old subject resulted in the development of signs and symptoms identical with those described for swimming-bath conjunctivitis. This result was observed previously by Gebb,[17] Hartman,[20] Kalt,[21] and Thygeson,[11] and led them to conclude that this was the adult form of inclusion blennorrhea. In the remaining 39 subjects of the direct conjunctival-passage experiments, the general manifestations were similar to or identical with those of the first. There were variations in severity of signs and symptoms (table 5) but the variations were irregular and not progressive. Furthermore, the variations in severity were no more extensive than those observed in cases of inclusion blennorrhea of the newborn as described in part I of this report. Corneal complications were limited to transitory, fine, superficial, epithelial disturbances which were present only during the period of maximal manifestations in the acute phase and were no worse than those observed in cases of inclusion blennorrhea of the newborn (part I). Neither infiltrates nor pannus formation was found upon examination with slitlamp and biomicroscope in any case of the series. Therefore, it may be concluded that, in this series of 40 consecutive conjunctival passages, the etiologic agent of inclusion blennorrhea did not change its disease-producing characteristics nor progressively alter its virulence.

Bacteriologic studies in this group of consecutive conjunctival inoculations failed to reveal the presence of pathogenic bacteria except in four cases. Cultures from subjects number XI, XIII, XVIII, and XXIV revealed bacteria commonly classified as conjunctival pathogens, but the organisms were different in each case; that is, Streptococcus viridans, D. pneumoniae, type viii, Staphylococcus aureus, and D. pneumoniae, type vi. This inconsistency in species of pathogenic bacteria and the irregularity of their appearance in the series led to the conclusion that they were secondary invaders, without etiologic significance. This conclusion was

substantiated by the results of passage inoculations from these cases. As previously described, the inoculation was made to the subsequent subject from each of these cases while bacteria were present and demonstrable in conjunctival scrapings. However, each recipient subject (numbers XII, XIV, XIX, and XXV) had one drop of 1-percent aqueous solution of silver nitrate instilled into each conjunctival sac 6 hours and again 20 hours after the inoculation. Subsequent cultures from these cases did not reveal pathogenic bacteria, but the onset and manifestations of inclusion blennorrhea were unaffected (table 5). Furthermore, this furnished experimental proof for the clinical deduction that Credé prophylaxis did not prevent the development of inclusion blennorrhea. Additional proof of the same point was furnished by the experience with subject number XXVI who was treated with 0.5-percent silver-nitrate ointment three times a day for three days after the inoculation without preventing the development of inclusion blennorrhea.

Leber cells were found in scrapings from each case of this series. Although this observation has not been stressed by previous observers, it was not interpreted as signifying a change in the character of the etiologic agent, because approximately equivalent numbers of these cells were found in scrapings from cases of inclusion blennorrhea of the newborn (part I).

The essential difference between inclusion blennorrhea of the newborn and the adult, as exemplified by these two series of cases (part I and part II), was the appearance of follicles early in the acute phase of the adult. They appeared 60 to 90 days after the onset of symptoms in the newborn. This difference, probably, is anatomic rather than pathologic, since the adenoid layer of the substantia propria of the conjunctiva "is absent in the newborn and only commences to develop 2 to 3 months after birth."[22] In other respects the two groups of cases were similar (table 7).

TABLE 7

COMPARISON OF AVERAGE MANIFESTATIONS OF INCLUSION BLENNORRHEA

	Newborn	Adult
Incubation period	8 d.	8 d.
Developmental phase	few hrs. to 6 d.	few hrs. to 6 d.
Acute phase	21 d.	21 d.
Duration of:		
Edema	21	21
Pseudomembranes	3–7	2–7
Preauricular adenopathy	32	23
Conjunctival infiltration	59	39
Discharge	60	44
Inclusion bodies	66	64
Appearance of follicles	2–3 mo.*	3–5 d.*
Duration of follicles	5.5 mo.	5 mo.
Total duration of signs	7 mo.	5 mo.

* From onset of signs.

Conclusions. 1. In this series of 40 consecutive conjunctival passages the etiologic agent of inclusion blennorrhea did not change its disease-producing characteristics nor progressively alter its virulence.

2. The signs and symptoms produced in each subject, as a result of the inoculation, were those of swimming-bath conjunctivitis or adult type of inclusion blennorrhea.

3. Further proof of the nonbacterial nature of the infectious agent was furnished by this series of cases.

4. Experimental proof of the ineffectiveness of silver salts in the prevention of inclusion blennorrhea was observed in five cases.

5. Large mononuclear phagocytes (Leber cells) were observed in the scrapings from all cases.

ACKNOWLEDGEMENTS

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tion and aid in gathering material for part I of this study.

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THE ETIOLOGY AND TREATMENT OF TOBACCO-ALCOHOL AMBLYOPIA*

Part II

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New York

Case 9. L. W., aged 58 years, was referred to the Neurological Institute in August, 1937, by his oculist because of "signs of a pituitary lesion." He stated that for the previous nine months he had noticed an increasing blur in his vision. At first he thought this was due to dirt on his glasses and he wiped them off repeatedly but in vain. Six months before admission he consulted an optometrist who sold him new lenses which did help his condition. The patient was a very intelligent person and he had figured out just where the "blur" was located in his visual field. It was an area in each field just temporal to the point of fixation; these bitemporal field defects which actually were typical centrocecal scotomas (fig. 5), probably caused his oculist to think he had a pituitary lesion. The neurologic examination was entirely negative except for the eyes, and the patient was referred to me.

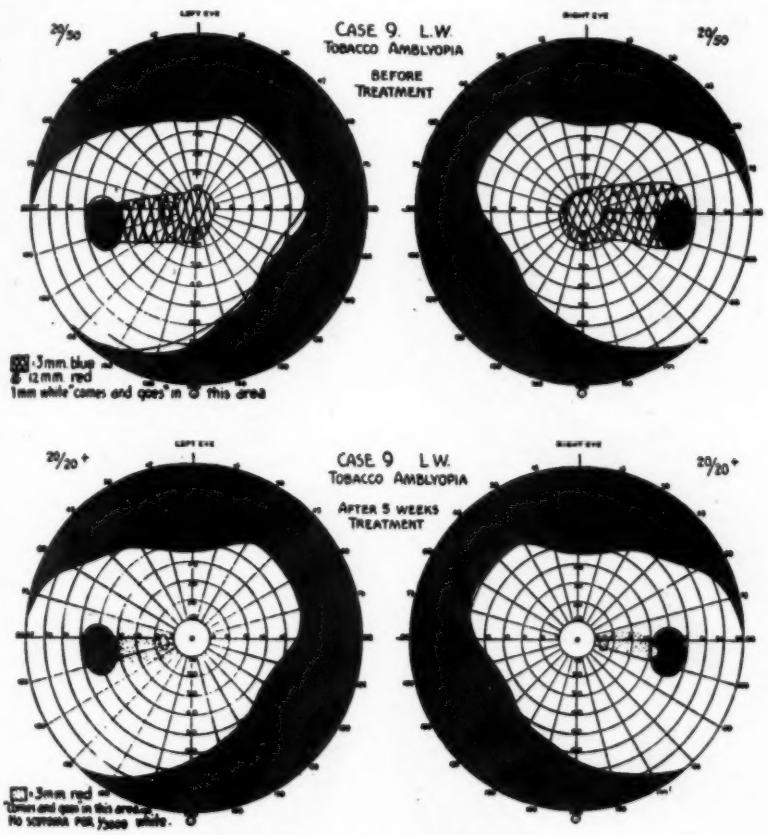


Fig. 5 (Carroll). Case 9. Fields of L. W.

At the time of onset of the amblyopia the patient was smoking three cigars daily and one package of cigarettes in three days. Thus he was not a heavy smoker and he consumed no alcohol. After being questioned on this point day after day he finally admitted that before the last war he bought a quart of liquor, but

* Part I appeared in the preceding issue of this Journal.

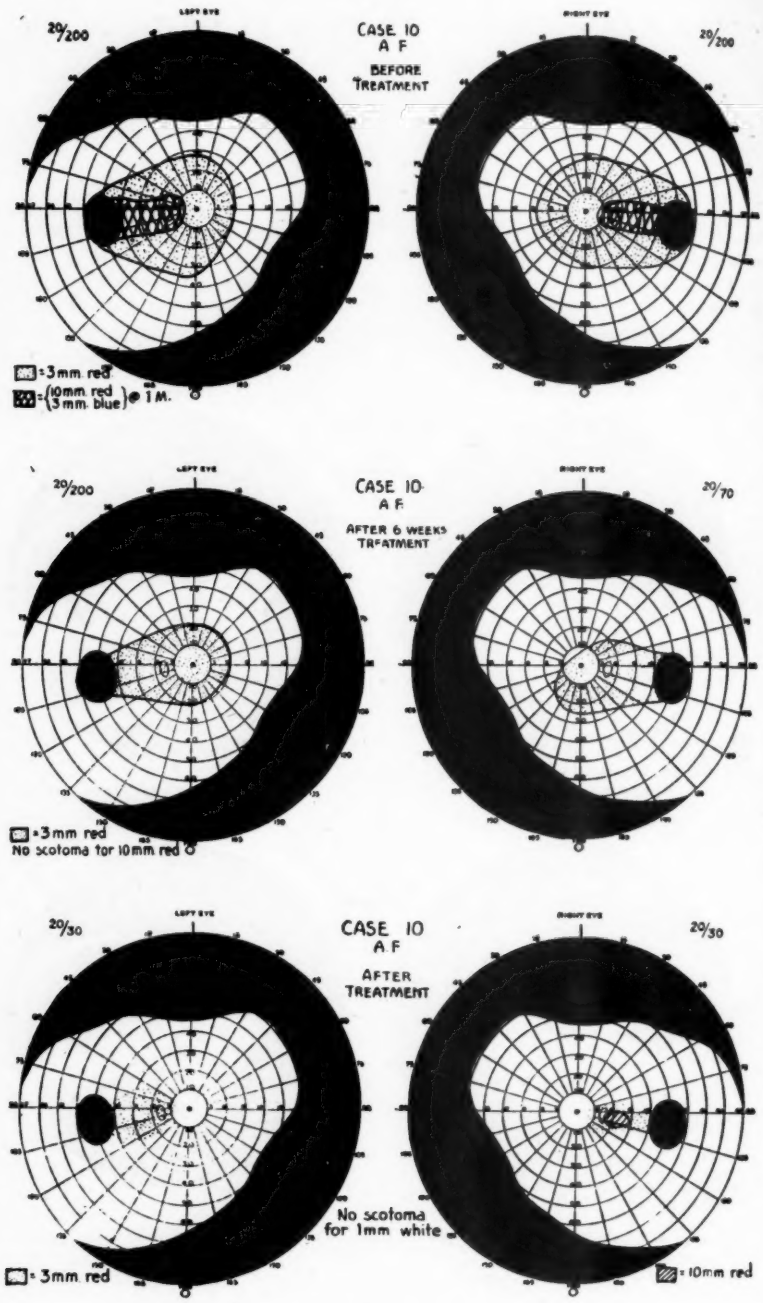


Fig. 6 (Carroll). Case 10. Fields of A. F.

stated that he still had a pint of it left, 20 years later. He is considered a teetotaler. The patient had lost 30 pounds during the last year. He was working for the W.P.A. and his financial status was such that he was economizing on food. The dietary history indicated that his intake of vitamin B_1 was borderline in adequacy, not definitely deficient.

Visual acuity in each eye was 20/50. Visual fields showed centrocecal scotomas (fig. 5).

The retinal vessels showed moderate sclerosis, and numerous drusen were present in the macula. Gastric analysis revealed absence of hydrochloric acid even after the administration of histamine. The patient was placed on a high-vitamin diet supplemented by brewers' yeast in doses of 2 teaspoonfuls four times daily, vegex in doses of 1 teaspoonful three times daily, liver extract in doses of 5 c.c. three times weekly, and dilute hydrochloric acid in doses of 15 drops before meals. He smoked one to two cigars a day more than while developing the amblyopia—that is, four to five cigars daily—and consumed at least as many cigarettes as previously.

He remained in the hospital five weeks on this regime. At no time was the use of tobacco decreased. The vision increased from 20/50, O.U., to 20/20+, O.U., during this time, and the fields improved as shown in figure 5. The residual scotoma gradually decreased in size until it could not be plotted. Twenty months after his first examination by me he returned for a check-up. He had continued to smoke the usual amount; his diet was much better, and he was taking 3 tablespoonfuls of yeast weekly. Vision was 20/20, O.U., and there was no evidence of any scotomas.

On June 23, 1942, almost five years after his first examination, he again returned for a check-up. Vision was O.U. 20/15, and no scotoma could be outlined. He had never decreased his consumption of tobacco. His diet was adequate in all respects.

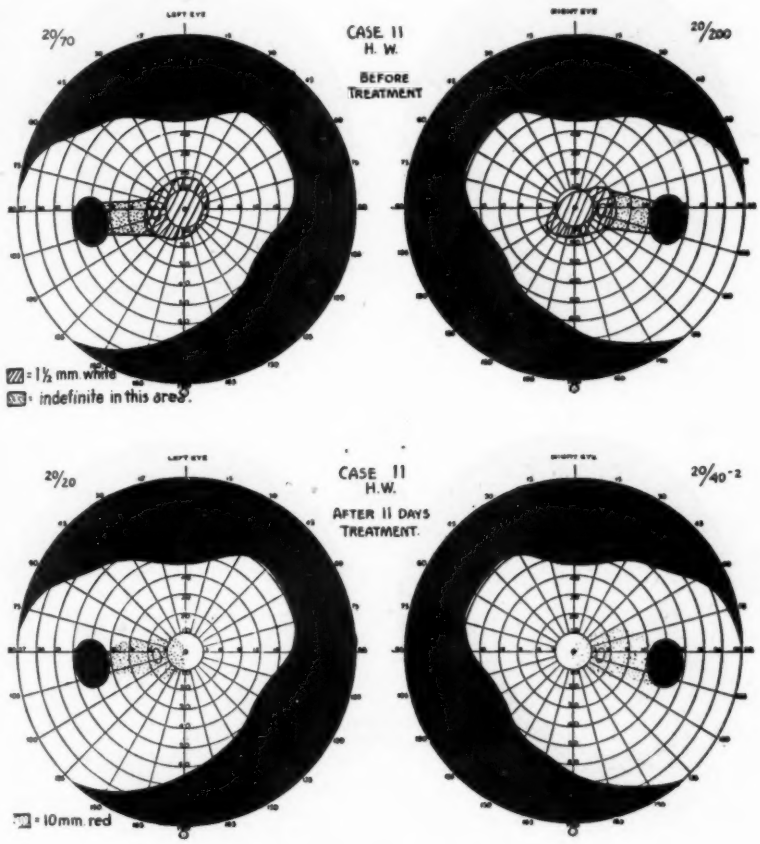


Fig. 7 (Carroll). Case 11. Fields of H. W.

Case 10. A. F., aged 48 years, was admitted to the Eye Institute on February 9, 1938. He stated that his vision had been gradually failing for six months and that he had been unable to read for three months. He smoked one package of cigarettes and one to two cigars daily, and drank four to five highballs daily. Vision corrected was O.D. 20/200 and O.S. 20/200, and the visual fields showed typical scotomas (fig. 6). The discs appeared to be normal. No free

hydrochloric acid was present, according to the gastric analysis, even after the administration of histamine. The patient received one pint of liquor daily and a diet low in all vitamins. This diet was calculated to be just adequate, or perhaps slightly inadequate, for vitamin content. However, he received 33 mg. vitamin B by mouth daily, and 10 mg. intravenously daily for nine months after his discharge from the hospital his vision remained at 20/40.

He returned for a check-up four years later. The vision was 20/30, O.U. He claimed that he had decreased his intake of alcohol but was using the same amount of tobacco.

Case 11. H. W., aged 30 years, was first refracted in the Eye Department of the Vander-

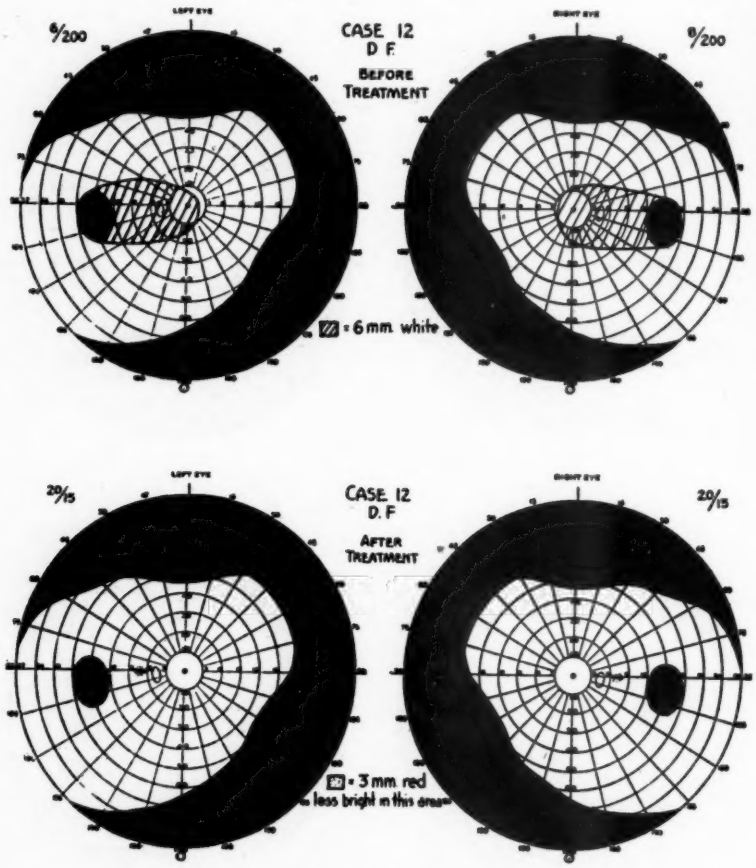


Fig. 8 (Carroll). Case 12. Fields of D. F.

three weeks, and then 10 mg. by mouth daily. During the six weeks of hospitalization the visual fields improved as shown in figure 6. The visual acuity in the left eye did not show improvement, however, until four months after onset of treatment, and 20/40 vision was not obtained until three months later.

The patient was instructed in obtaining a well-balanced diet at home, but was not coöperative. He continued to drink and smoke as much as ever, and on his visits to the clinic usually smelled strongly of alcohol. He also continued to take 3 to 6 mg. of vitamin B_1, and bilt Clinic on March 27, 1935. Vision with correction was 20/20+, O.U. He returned on June 17, 1938, and the vision could not be corrected to better than O.D. 20/200, O.S. 20/70. The same high myopic astigatism which previously had been corrected to 20/20 was present, and there was nothing in the fundi to explain the reduced vision. Fields were typical of tobacco-alcohol amblyopia (fig. 7). Questioning revealed that he smoked 30 cigarettes daily and drank 4 to 5 highballs daily. He was on home relief or W.P.A. and his diet seemed inadequate. He was admitted to the hospital, placed on a diet

low in all vitamins, given one pint of liquor daily and 15 mg. of synthetic vitamin B_1. In 11 days the vision with the same correction was O.D. 20/40—2, O.S. 20/20, and the patient said there had been "remarkable improvement." The spaghetti menu which was used to obtain the deficient diet was so monotonous that the patient ate very little and lost 11 pounds in two weeks, but he took his 15 mg. of vitamin B_1 daily. Although there was a striking improvement in the visual acuity, the fields in 11 days showed fairly dense scotomas (scotoma for 10 mm.-red test object at 1 meter but no scotoma for 1-mm. white test object at the same distance—a disproportion which is a favorable prognostic sign). He remained in the hospital five weeks on a diet deficient or borderline in all vitamins except synthetic B_1. On this regime he lost 15 pounds, but the vision on discharge had increased to O.D. 20/30—, O.S. 20/20, and the scotomas were much smaller. He stated later that the day after discharge from the hospital he developed a dryness of the hands and pains in the arms and calves of the legs which lasted four to five days. He was observed over a further period of three months in the Clinic, and the final vision was 20/20, O.U.

In July, 1942, the vision was still 20/20, O.U.

Case 12. D. F., a 45-year-old truck driver, was admitted to the Eye Institute on January 23, 1939. He stated that two years previously he had weighed 215 pounds. At that time it was discovered that he had diabetes, and he went on a diet which resulted in his losing 72 pounds. For the past two years he had entirely abstained from the use of alcohol, but he was a moderately heavy smoker, consuming a package of tobacco every 1½ days and three cigars daily. Four months previous to his admission he noticed that his vision was decreasing and this continued to get worse. He had noticed some "neuritis" in his knees and right shoulder.

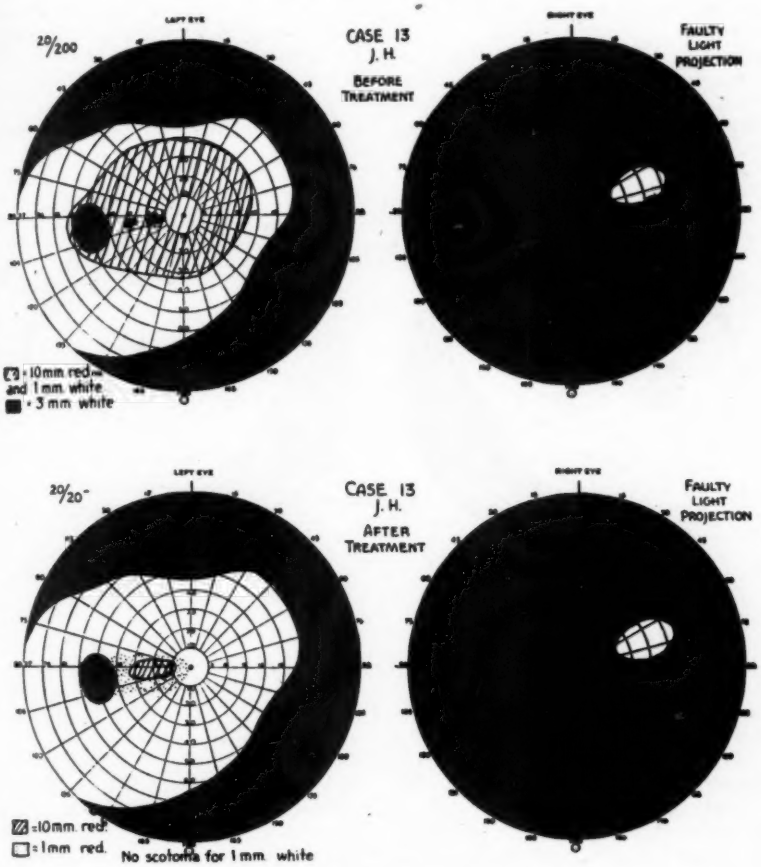


Fig. 9 (Carroll). Case 13. Fields of J. H.

Vision was O.D. 20/200, O.S. 10/200, and the fields were characteristic of tobacco amblyopia. Ocular examination was otherwise negative. During the 13 days he remained in the hospital and for a total of three months he showed no improvement. He continued on the same diet, the same amount of tobacco, and 10 mg. of vitamin B_1 daily. Vision decreased to O.D. 8/200, O.S. 6/200 one month after discharge from the hospital. The tobacco was then stopped entirely.

No improvement was seen and in another month he began to take brewers' yeast, 6 tablespoonfuls daily in milk. He put on 10 pounds in weight in a month and the vision began to improve. In six months the vision was O.D. 20/30—, O.S. 20/200. He had stopped smoking for two months. At this point he resumed smoking his usual amount or somewhat more than usual but continued the yeast in large amounts (6 tablespoonfuls daily). In seven months vision was O.D. 20/20+, O.S. 20/30—. In 11 months the vision was O.U. 20/15. He was smoking six cheap (three for 10 cents) cigars daily and one package of tobacco every 1½ days and taking 4 tablespoonfuls of yeast daily. In one year there was no change, and the field was as shown in figure 8. He continued to take 1 tablepoonful of yeast daily.

On June 23, 1942, 3½ years after hospitalization, vision was O.D. 20/15, O.S. 20/20—. In the area between the blindspot and the point of fixation in each eye a 1-mm. red test object at 1 meter seemed less bright than it did nasally but no scotoma could be outlined. He was a heavy smoker and had not decreased his consumption of tobacco. He still uses no alcohol. He was on a well-balanced diet for his diabetes.

Case 13. J. H., aged 50 years, came to Vanderbilt Clinic on October 1, 1940. He stated that the vision in the right eye was lost in childhood, owing to an injury with a stone, and that the eye had been divergent for many years. The vision in the left eye had become increasingly blurred during the preceding five months. On questioning he said that about the time of onset of blurred vision he was having many financial worries and had lost 30 pounds in weight. To indicate his weight loss he pulled out his vest which obviously was now too large for him. He smoked "most of the time"—eight cigars daily as well as occasional cigarettes and a pipe. He also drank about one-half to one pint of liquor daily. Vision was O.D. light perception, O.S. 20/200—. The right eye was divergent and an old traumatic chorioretinitis accounted for the vision. The disc of the left eye appeared normal, but the field showed a centrocecal scotoma (fig. 9). His oculist had prescribed potassium iodide solution, but the only effect noticed after taking this was a mild dermatitis which disappeared rapidly on discontinuance of the solution. The patient was admitted to the Eye Institute. In 26 days his vision, O.S., improved from 20/200 to 20/40. During this time he continued to consume his usual amount of tobacco and alcohol. He received a diet low or inadequate in all the vitamins, but received 20 mg. of vitamin B_1 (Betaxin) and 12 capsules of vitamin-B complex daily. At home he has continued his usual regime in respect to diet, alcohol, and tobacco, but has taken faithfully 1 teaspoonful of elixir of vitamin-B complex (Betaplexin) three times daily. The visual acuity, O.S., gradually increased to 20/20— in a few months and has remained at that point up to the present (June 19, 1942), but a scotoma for red still remains.

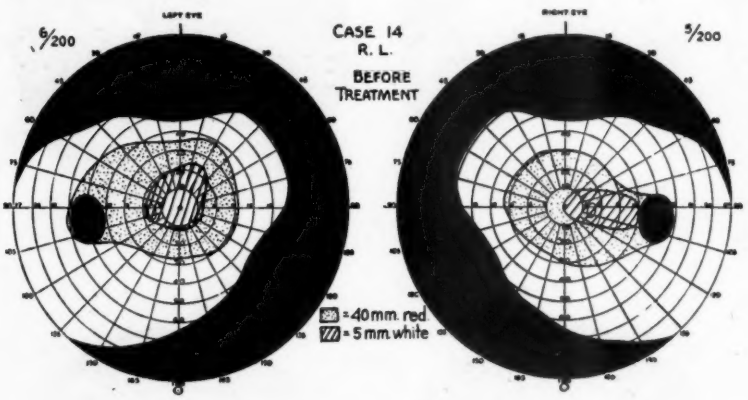


Fig. 10 (Carroll). Case 14. Fields of R. L.

Case 14. R. L., a 43-year-old Negro, was referred by his oculist because of "optic neuritis with retinal hemorrhages." The patient stated that his vision had been getting worse for two

months. He admitted drinking about one to two pints of "King Kong" (a bootleg whisky sold in Harlem) daily and smoking two packages of tobacco weekly. His diet for the past year seemed to have been inadequate. Vision was O.D. 5/200, O.S. 6/200. The disc of the right eye appeared hyperemic, and a small fresh linear hemorrhage was present near the inferior temporal vein. The left disc also looked hyperemic, and a striate hemorrhage was located 1 disc diameter from the papilla along the superior temporal artery. The field is shown in figure 10. The patient was admitted to the Eye Institute on January 15, 1940. The patient's liver was palpable 2 finger breadths below the costal margin. The skin on the legs showed a roughness and desquamation which the medical consultant thought due to vitamin-B-complex deficiency disease.

In the hospital he received one pint of liquor and his usual amount of tobacco daily. His diet was inadequate in all vitamins, but he received 40 mg. of vitamin B_1 daily. In 26 days his vision was slightly better (20/200, O.U.) and he was allowed to go home. In another month the vision was 20/70, O.U. In another month, after taking nicotinic acid in doses of 200 mg. daily, as well as 10 mg. of vitamin B_1 daily, vision was 20/20, O.U. The next month, after taking Betaplexin in doses of 2 tablespoonfuls three times daily, the vision was 20/20—, O.U., and it remained at that level for the next six months.

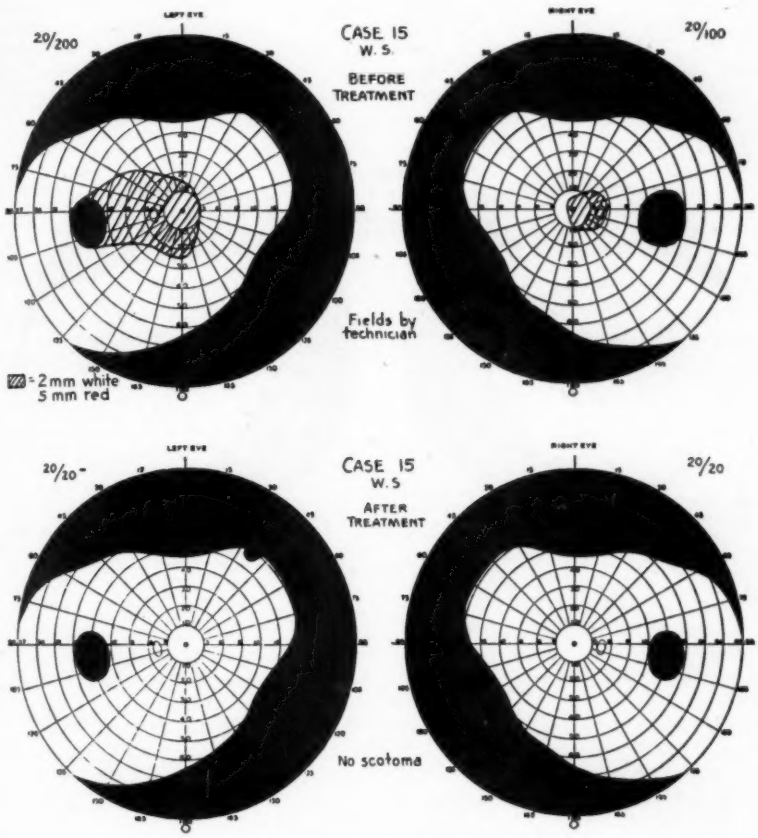


Fig. 11 (Carroll). Case 15. Fields of W. S.

Case 15. W. S., aged 36 years, another Negro from Harlem, also had been drinking about one quart of "King Kong," a cheap bootleg whisky, daily. He was referred by Dr. Charles Marrin, who had made a diagnosis of tobacco-alcohol amblyopia. On January 22, 1940, the patient was admitted to the Eye Institute. The vision was O.D. 20/100, O.S. 20/200. The discs appeared negative for pathologic change and the fields were as shown in figure 11. The patient stated that his vision had become blurred six months previously and had gradually become worse. Physical examination showed an enlarged liver.

He was allowed to drink one pint of liquor daily and smoke as many cigarettes as he had previously taken. The diet was made inadequate in all vitamins, but he received 40 mg. of vitamin B_1 daily. After three weeks on this regime his vision improved to O.D. 20/20—, O.S. 20/50—, and he was discharged with instructions to take 10 mg. of vitamin B_1 daily. He returned to the clinic in a month saying that his vision had become much worse. Vision was recorded as O.D. 20/50, O.S. 20/200, and the fields recorded by a technician showed a marked contraction, especially the field of the left eye. The patient was given nicotinic acid in doses of 100 mg. daily, as well as vitamin B_1, and in two weeks his vision was again O.D. 20/30, O.S. 20/50. It was not clear exactly why he temporarily developed a contracted field and loss of vision but it was considered possibly due to a deficiency in the other components of vitamin B. Whether, however, the nicotinic acid caused the improvement cannot, of course, be definitely stated. He was given brewers' yeast in doses of 6 tablespoonfuls daily, and in five weeks the vision was O.D. 20/20, O.S. 20/30+. He had continued to consume one pint of liquor every day. On February 19, 1942, when last seen, his vision was O.D. 20/20, O.S. 20/20—. No scotoma could be found. His breath had a heavy alcoholic odor, but he stated he was drinking only half as much as formerly. He was taking small amounts of yeast.

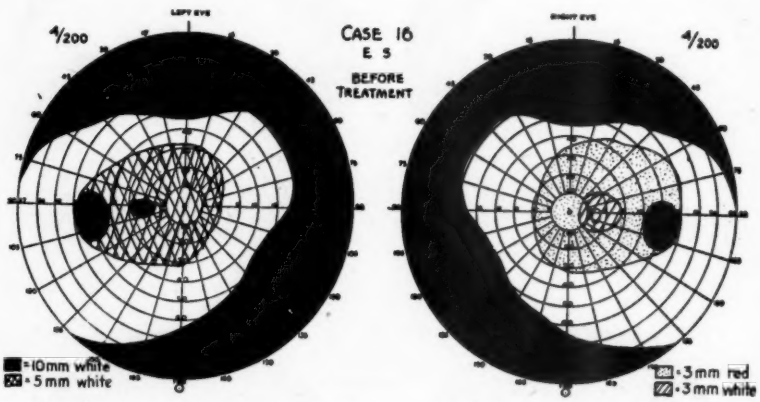


Fig. 12 (Carroll). Case 16. Fields of E. S.

Case 16. E. S., a 32-year-old Negro, said that his vision had failed in one week four months previously and that he had been unable to read since that time. He drank about one pint of liquor daily and smoked one package of cigarettes. The patient complained of having no appetite and admitted that he had lost 10 pounds in weight recently. One oculist had noticed pigment mottling in the macula of each eye, and a tentative diagnosis of macular degeneration had been proposed. Vision was O.U. 4/200, the discs showed moderate (No. 2 on a basis of No. 1 to 4) temporal pallor, and there was a slight pigment stippling in each macula. The fields (fig. 12) quickly indicated the correct diagnosis. The patient was admitted to the Eye Institute on May 6, 1940, and while there received daily, vitamin-B_1 doses of 15 mg., 6 capsules of vitamin-B complex (Lederle), 200 mg. of nicotinic acid, and 12 oz. of liquor. He was discharged in 18 days, slightly improved. In one month vision was 20/200, O.U.; in five months, 20/70, O.U. He continued his smoking and drinking. His wife stated that he took his vitamin-B complex or brewers' yeast daily and that he was "always hungry." Previously he had had a "very poor appetite."

Case 17. A. Mc., aged 44 years, was a volunteer airplane observer. He stated that it was very cold in winter to stand on the roof of his post looking for aircraft. Therefore he drank about one pint of gin or rye daily as well as a "few beers." He smoked almost two packages of cigarettes daily. His appetite was "poor." Finally he consulted Dr. Ramon Castroviejo, who made the diagnosis and allowed me to treat him. The patient said that his vision had been decreasing for five months. The vision on December 30, 1941, was O.D. 20/40, O.S. 20/40—. The discs appeared to be normal and the fields were as shown in figure 13. The patient was given a pint of Betaplexin and advised to take 6 teaspoonfuls daily. In two weeks he returned to the office very much worse, although he had taken the Betaplexin faithfully. The vision had decreased from 20/40—, O.U., to O.D. 10/200, O.S. 20/100. He was hospitalized at once and put on the following regime daily: Betaplexin in doses of 12 c.c. three times daily, thiamin in

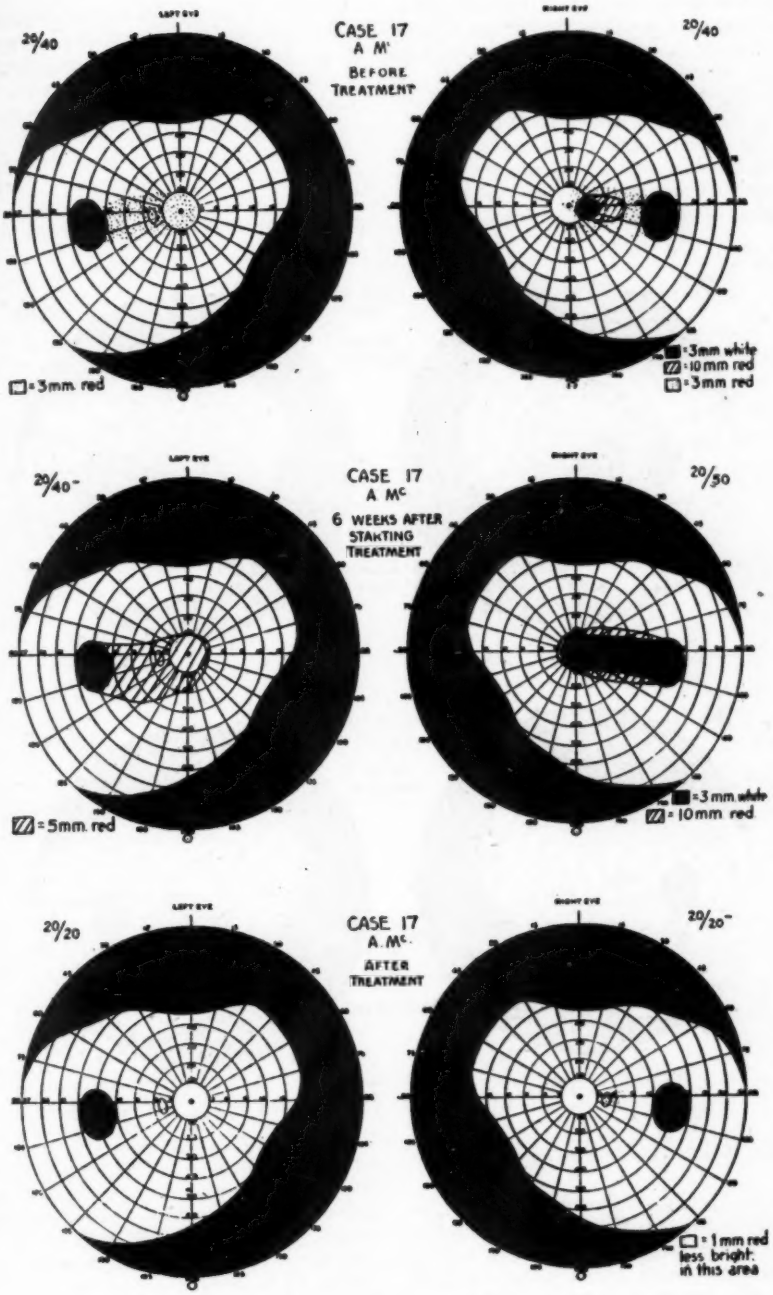


Fig. 13 (Carroll). Case 17. Fields of A. Mc.

doses of 20 mg. intravenously for one week and then 20 mg. by mouth, one pint of liquor, and his usual number of cigarettes. In one month in the hospital on this regime there had been a considerable improvement, vision O.D. 20/50, O.S. 20/40—, but the fields were still worse than when the patient had first been seen in the office (fig. 13). His weight increased from 132 to 148 pounds in this period. Two weeks later vision was O.U. 20/20—. His fields have im-

proved considerably (fig. 13). He admitted taking his customary amount of liquor and tobacco again. He also took 24 c.c. (2 teaspoonfuls, three times daily) of Betaplexin and 10 mg. of vitamin B_1 daily.

On June 25, 1942, vision was O.D. 20/20—, O.S. 20/20; no scotoma could be plotted in either eye. He had been "celebrating" for the past month and was taking over a quart of whisky daily, despite all advice to the contrary. fingers at 2 feet, O.S. counts fingers at 4 feet. O.U. anterior chamber shallow, vitreous opacities, granular appearance of macula, tension normal, fields as shown in figure 14. The patient said he had been drinking more than usual since his oculist had informed him that he had macular degeneration and that it was unlikely that his central vision would ever improve. Dr. Wheeler gave a favorable prognosis. The patient was advised to discontinue the use of

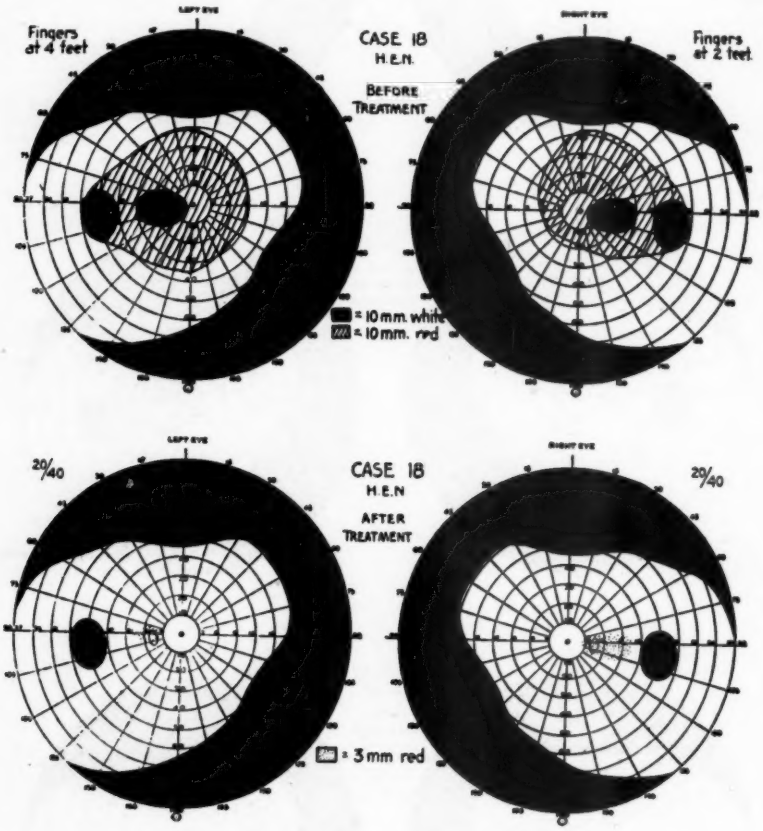


Fig. 14 (Carroll). Case 18. Fields of H. E. N.

He also took 10 mg. of thiamin chloride every day.

Case 18. H. E. N., a 73-year-old newspaper editor, consulted the late Dr. John M. Wheeler, on April 17, 1936. He stated that his vision had become increasingly blurred for the past five weeks. His oculist had made a diagnosis of macular degeneration. The patient smoked six cigars and drank three bottles of beer and a few highballs daily. Since he had been accustomed to taking as much as this for several years, at least, his oculist felt that tobacco and alcohol could not be important in the etiology of his poor vision. Vision was O.D. counts tobacco and alcohol but he did not. However, he did take all the medications I ordered, which included daily, brewers' yeast 4 tablespoonfuls, Vegex 2 tablespoonfuls, and wheat germ 4 tablespoonfuls. In one month vision was O.D. 20/200 O.S. 20/70; after two months O.D. 20/100, O.S. 20/40; after three months O.D. 20/50—, O.S. 20/20—; after five months O.D. 20/40+, O.S. 20/20—. After one year vision was O.D. 20/30, O.S. 20/30; after six years, O.D. 20/40, O.S. 20/40. This patient is now 79 years of age. Against advice he at first continued his usual consumption of alcohol and tobacco. At present he is using approximately

the same amount. Lens and vitreous opacities are now sufficient to explain the 20/40 vision, O.U. He has been seen at six-month intervals for the past five years. He still takes 1 to 2 tablepsooonfuls of brewers' yeast or 2 to 4 capsules of vitamin-B complex daily. Present fields are shown in figure 14.

Case 19. A. B. was first seen at the Vanderbilt Clinic on November 19, 1940. He said that his vision had been blurred for several months and that he had not been able to read for the past four weeks. The vision was O.D. 5/200, O.S. 20/100, and the fields showed centrocecal scotoma (fig. 15). He was advised to take 12 brewers' yeast tablets daily. Two weeks later I first examined the patient. The vision was unimproved. In each macular area drusen were present as well as some pigment stippling. The discs appeared to be normal but in the fundus of the left eye there was a large striate retinal hemorrhage close to the inferior temporal vessels—1½ disc diameters from the papilla. The patient drank some wine, beer, and probably one-half pint of whisky daily, and smoked one package of cigarettes daily. His appetite was poor. He was admitted to the Eye Institute on December 9, 1940, and was given a low vitamin diet, 40 mg. of vitamin B, nine capsules of vitamin-B complex, one pint of liquor, and an unlimited number of cigarettes daily. The liver was found to be enlarged. The prothrombin time was increased, but the results of capillary fragility tests were normal. The retinal hemorrhage in the left eye became absorbed in one week. Dr. Ferobee of the Neurological Institute found 360 micrograms of vitamin B_1 in the urine following the oral administration of 2 mg. of thiamin chloride, and stated that no vitamin-B_1 desaturation was present, but this test was made three weeks after the beginning of treatment. The patient was discharged from the hospital after 25 days on the aforementioned regime which included one pint of liquor daily and his usual supply of to-

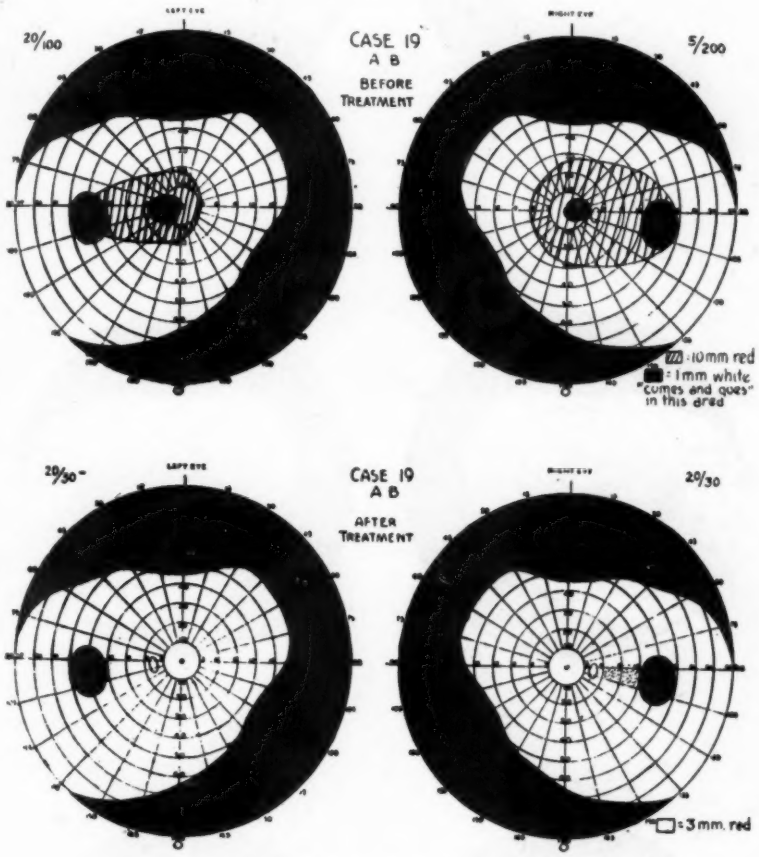


Fig. 15 (Carroll). Case 19. Fields of A. B.

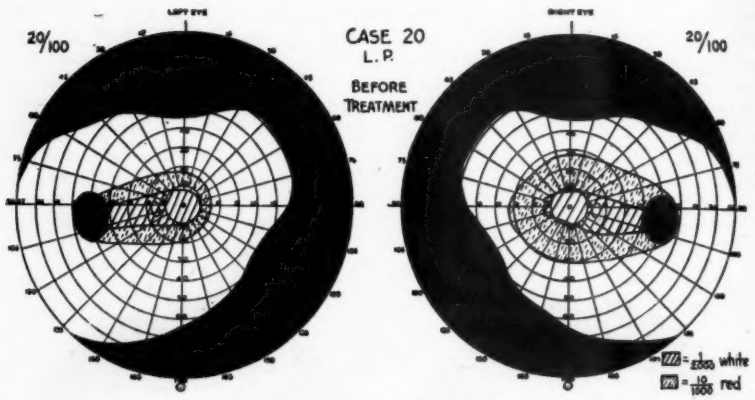
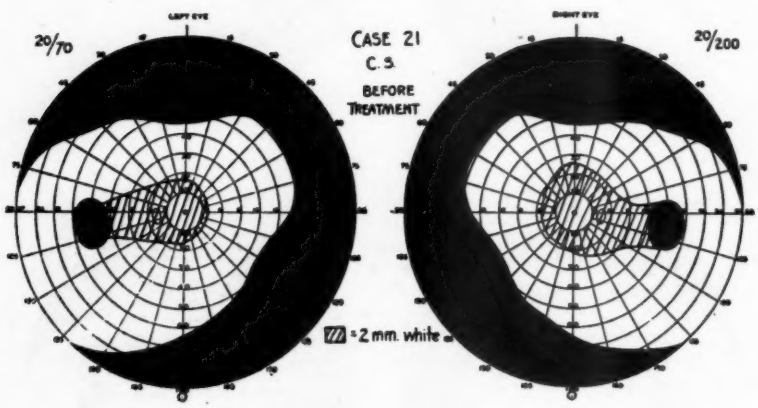


Fig. 16 (Carroll). Case 20. Fields of L. P.



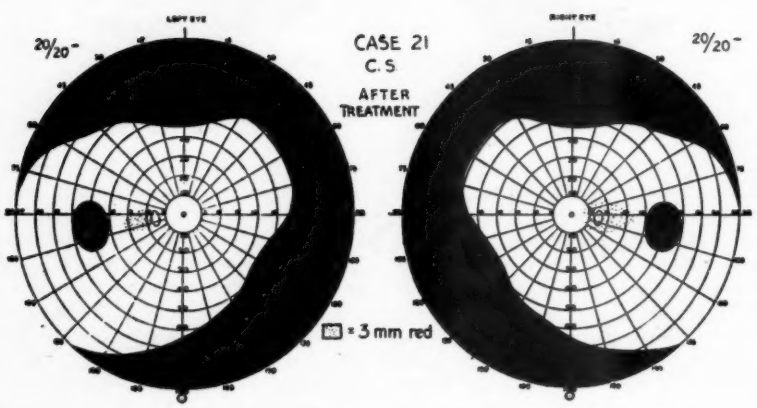


Fig. 17 (Carroll). Case 21. Fields of C. S.

bacco. His vision improved from O.D. 5/200, O.S. 20/100 to O.D. 20/80+, O.S. 20/30—.

On June 30, 1942, 18 months later, the vision was O.D. 20/30—, O.S. 20/30, and the fields were as shown. He was smoking the same amount of tobacco but claimed he had somewhat decreased his consumption of alcohol.

Case 20. L. P., aged 42 years, came to Vanderbilt Clinic on February 29, 1940. His vision had been failing for eight months. He drank beer drinking during this period. Yeast, 4 tablespoonfuls daily, was substituted for the aforementioned therapy since the cost was less. In the next six months the vision gradually improved to 20/30—, O.U., and at his last visit, in February, 1942, two years after the first examination, the vision was 20/30, O.U. Visual fields were not recorded at the last visit but the discs appeared to be normal. He was drinking and smoking the same amount that he had while

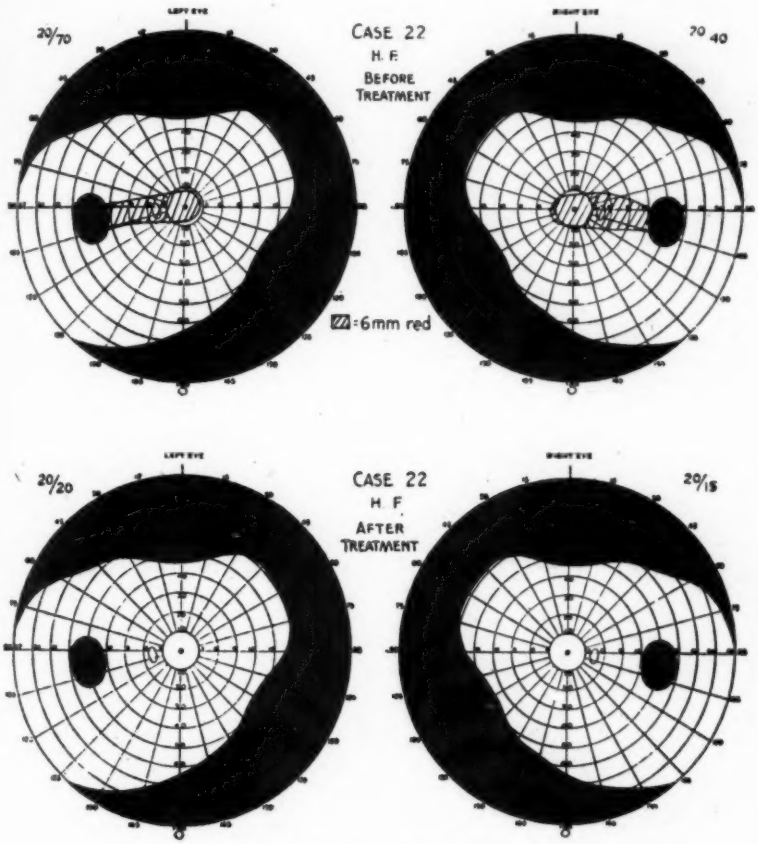


Fig. 18 (Carroll). Case 22. Fields of H. F.

about two quarts of beer daily and smoked a package of cigar clippings every other day. His teeth were in very poor condition, and he had not been eating well. Vision was O.U. 20/100, and the visual fields were as shown in figure 16. The discs were normal in appearance. A chronic left maxillary and ethmoid sinusitis was present. The patient took 40 mg. of vitamin B_1 daily during five days of hospitalization and then 10 mg. of B_1 and 100 mg. of nicotinic acid daily at home. His vision improved slowly, and in four months was only O.D. 20/50—, O.S. 20/70+. He said that he had decreased his developing the amblyopia, but had continued to take about 25 grams of yeast daily.

Case 21. C. S., a 59-year-old Italian doorman, was seen at Vanderbilt Clinic on October 2, 1941. His vision had been getting worse for the past year. He was a heavy smoker, using eight cigars daily and a package of tobacco every three days. He drank very little, only two glasses of wine daily with meals. His teeth were in poor condition, but he said they were no worse than they had been for years. The patient was on a diet for diabetes. Vision was O.D. 20/200, O.S. 20/70, and the fields were as shown

in figure 17. The discs appeared to be normal. The blood sugar was 197 mg. percent; a 24-hour urine analysis showed a 4+ sugar reduction. The patient was placed on 24 c.c. (2 teaspoonfuls, three times daily) of Betaplexin; he continued his usual consumption of tobacco and alcohol, and returned to the Clinic at intervals of several weeks. In one month there was no improvement; in two months vision was O.D. 20/70, O.S. 20/50—; in three months O.D. to be normal, but the visual fields were as shown in figure 18. On questioning, he stated that he smoked two cigars and six cigarettes daily but almost never took any alcoholic liquors. However, for the past six months his teeth had been in such poor condition that he had changed his diet. Only a few teeth were remaining in the upper jaw, and the patient had been intending to have these removed and get false teeth. His diet seemed inadequate. His

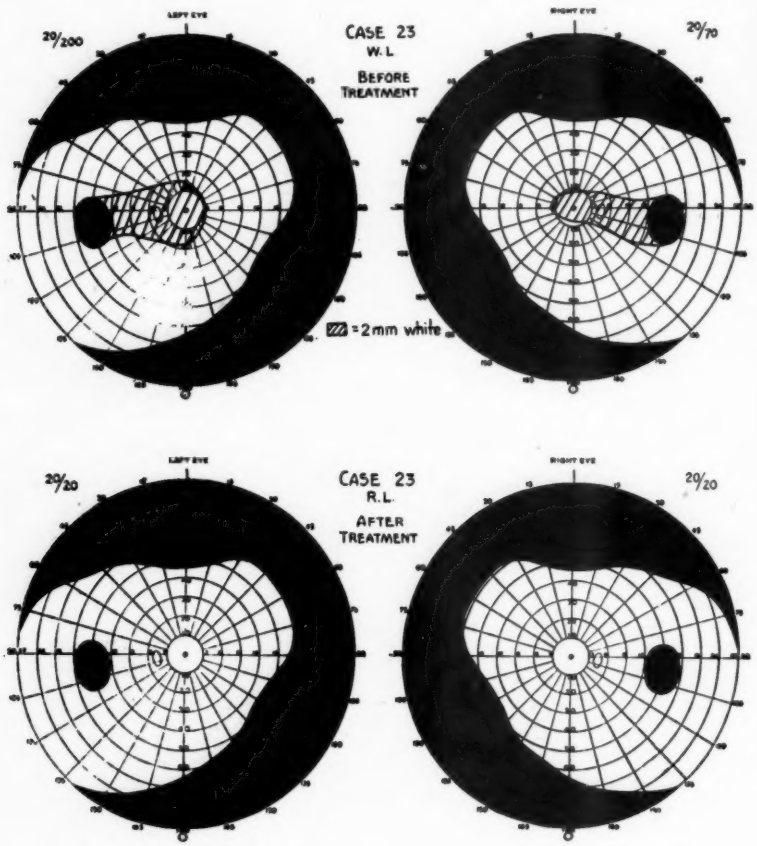


Fig. 19 (Carroll) Case 23. Fields of W. L.

20/50, O.S. 20/40; in four months O.D. 20/20—, O.S. 20/20—. The Betaplexin dosage was continued in the same amount and 10 mg. of vitamin B_1 daily was also taken. At the present time (June, 1942), the visual acuity is the same and the fields are as shown in figure 17. He has not decreased the use of tobacco or alcohol.

Case 22. H. F., a 45-year-old printer, had found it increasingly difficult to set his print for the past two months. When first examined, on March 16, 1940, his vision with correction was O.D. 20/40, O.S. 20/70; the fundi appeared family physician, who happened to be his next-door neighbor, confirmed what the patient stated regarding a very moderate use of tobacco, no intake of alcohol, but an inadequate and unbalanced diet. He asserted that the patient would eat only what he liked and since his dental condition had become so bad his choice of food was even more limited. The patient took powdered brewers' yeast, 4 tablespoonfuls daily in milk. In one month the vision had improved from O.D. 20/40, O.S. 20/70 to O.D. 20/20—, O.S. 20/30+. In four months vision

was O.D. 20/15, O.S. 20/20; no scotoma was present for even the smallest red test objects. He was smoking his usual number of cigars and cigarettes. At that time the yeast was stopped on the condition that he take a well-balanced diet, which was carefully outlined. Three months later the visual acuity was unchanged; namely, O.D. 20/15, O.S. 20/20.

Case 23. W. L., a 60-year-old unemployed salesman, came to Vanderbilt Clinic on December 7, 1936. He had been unable to read newsprint for three months, and new lenses from an optometrist had not improved his sight. Vision was O.D. 20/70—, O.S. 20/200 with correction. The fundi appeared to be normal, but the fields were as shown in figure 19. He smoked four to six cigars daily but had not had any alcoholic drink in a year. In fact he was sure that he had not had more than one drink a year for the past 10 years, and his wife confirmed this. In the last year he had lost 15 pounds in weight, and his diet was low in all vitamins and even in calories. He explained this by saying that he just did not have enough money to buy the right foods. The Food Clinic, however, was able to prescribe a high vitamin-B diet at no increase in cost to the patient. He also took 8 tablespoonfuls of yeast daily. Improvement was gradual. In three months vision was still only 20/70, O.U., in five months it was O.D. 20/40, O.S. 20/50; in seven months 20/30—, O.U.; and in eight months 20/20, O.U. No scotoma was found at this time (fig. 19). The patient had never decreased his smoking during these eight months but continued to take several teaspoonfuls of yeast daily. The results of a complete medical examination, which of course, included a urine examination, were negative. The patient, however, returned nearly two years later. He had lost more weight and was found to have a mild diabetes which could be controlled by diet without the use of insulin. He was last seen on August 25, 1942, five years after the onset of the amblyopia. Vision remained excellent. He had continued to take small amounts of yeast because he was on a somewhat restricted diet due to the diabetes.

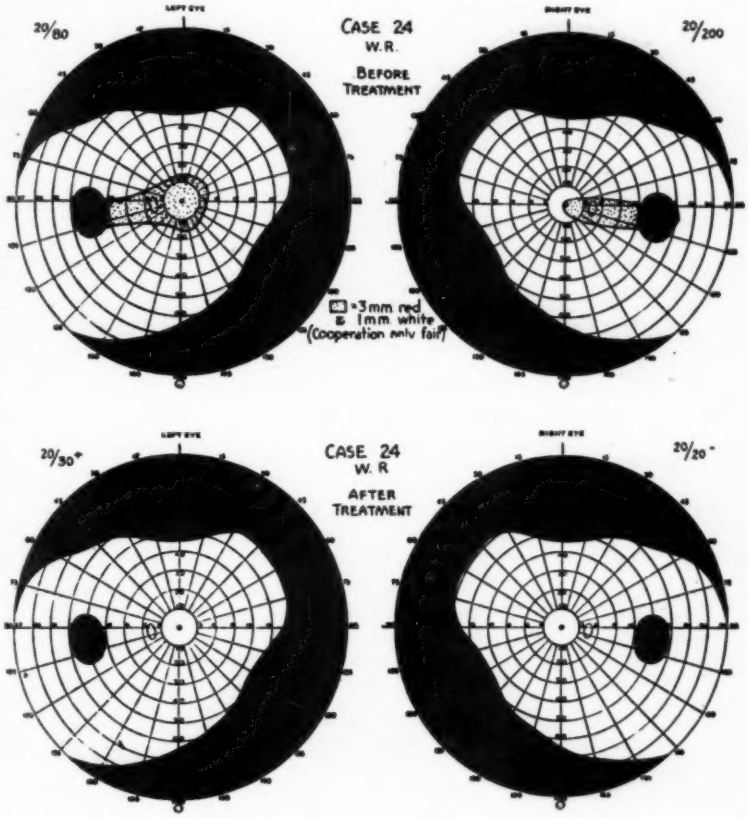


Fig. 20 (Carroll). Case 24. Fields of W. R.

Case 24. W. R., a 38-year-old Negro, came to

Vanderbilt Clinic on June 14, 1937. One year previously his vision had been sufficient to pass a driver's test in New York, but for the last five months it had grown progressively worse. Vision was O.D. 20/200, O.S. 20/80; the fundi appeared to be normal, and the fields were as shown in figure 20. At first he said that he took only a few drinks a day but finally admitted to taking about a quart of corn whisky daily until four weeks ago. Then, because his vision was decreasing, and he was having pains in his hands, feet, and the calves of his legs, he decreased his alcoholic intake. He was also a heavy smoker, using from 6 to 10 cigars daily. The patient was admitted to the Eye Institute, where a general physical examination revealed the presence of an enlarged liver. The results of a gastric analysis, blood and spinal-fluid Wassermann tests, and all other laboratory examinations were negative. The patient received daily 8 tablespoonfuls of brewers' yeast, 3 tablespoonfuls of vegex, 5 mg. of vitamin B_1, and 1 oz. of cod-liver oil. At first he was allowed to take one pint of liquor daily. This was gradually increased until he was consuming one quart, 4 oz.—that is, 36 oz. of liquor daily—the largest amount ever given to one of these hospitalized patients. He smoked his usual number of cigars and also began smoking a pipe. After one month of this regimen he was able to read newspapers. The vision had improved from O.D. 20/200, O.S. 20/80 to O.D. 20/50+, O.S. 20/40—. Two weeks later it was O.D. 20/30—, O.S. 20/20—, and in two months, when last examined, it was the same. Visual fields showed no scotoma. He was drinking and smoking as much as ever.

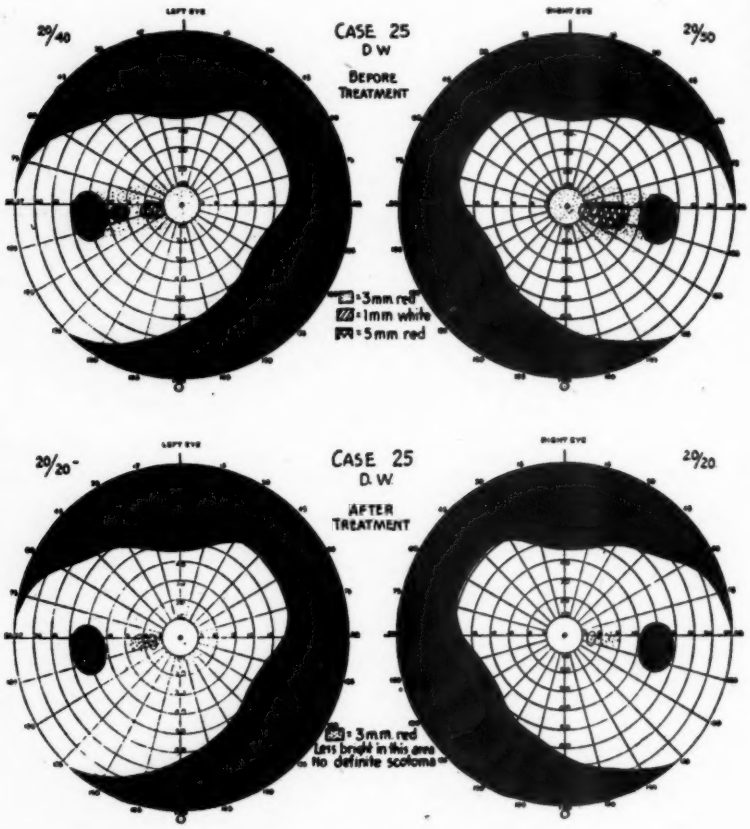


Fig. 21 (Carroll). Case 25. Fields of D. W.

Case 25. D. W., a 29-year-old colored housewife, had come to the clinic in an intoxicated condition on several occasions, and it was not until she was admitted to the Eye Institute on March 23, 1942, and allowed to go without alcohol for 24 hours that it was possible to plot satisfactory visual fields. She then stated that

she consumed one pint of rye whisky and one package of cigarettes daily. Vision with correction was O.D. 20/50, O.S. 20/40, and the visual fields were as shown in figure 21. Her diet had apparently been inadequate. On physical examination the liver was found to be enlarged. She was placed on a diet low in all vitamins and given 40 mg. of vitamin B_1 orally and 20 mg. intravenously daily. She received one pint of liquor daily at first and then this amount was increased slightly. She smoked one package of cigarettes daily. Within three weeks of her hospitalization on this regimen her vision improved from O.D. 20/50, O.S. 20/40 to 20/20, O.U. She was then seen frequently in the clinic. On June 4, 1942, when last examined, the vision was 20/20—, O.U. No definite scotoma could be outlined. She had been advised to discontinue drinking a month previously when her vision reached 20/20—, but she persisted. In fact she admitted drinking more than ever. She had continued to take two 10-mg. tablets of vitamin B_1 daily.

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X-RAY TREATMENT OF THROMBOSIS OF THE RETINAL VEIN AND OF SEVERAL TYPES OF IRIDOCYCLITIS

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ORIGIN AND DEVELOPMENT OF THIS X-RAY TREATMENT

Because of the good results obtained by the use of X rays for the bleeding of myoma uteri, I began to apply X rays in cases of hemorrhagic glaucoma in 1919. This was primarily attempted in the hope of avoiding enucleation, which is usually necessary because of the headaches and pain caused by the eyes. The results of this treatment were so satisfactory that I published them in 1920. Since that time the method has been used by many ophthalmologists.

The indications for the use of X rays in cases of hemorrhagic glaucoma were extended to other types of this ocular affection; such as chronic, absolute, and secondary glaucoma. The effect upon chronic glaucoma is not surprising, in view of the influence of X rays on the retinal vessels; in cases of absolute glaucoma due to thrombosis of the retinal vein the same causes obtain. Only in cases of secondary glaucoma of another etiology must we assume that X rays have a greater influence on the uvea than on the retina. From the ophthalmologic literature on the subject the following 12 reports have been collected:

(1) In 1935 Basile treated for one year one case of thrombosis of the trunk and six cases of thrombosis of the branches; in 1936, from 3 to 28 months, 11 cases of glaucoma and thrombosis of the central vein. He administered in the first series: 1/6-1/9 H.E.D. once a week for 4 to 6 weeks; in the 2d series: 2mA, 23cm. F.H.D., filter: 1/2Zn + 5Al, field: 4:4. Total dosage, 6 cases: 1 H.E.D.; 1 case: 5/6 H.E.D.; 1 case: 3/9 H.E.D.; 3 cases: 1.5 H.E.D.; 1 case: 3 H.E.D.—at intervals of a week, 6 to 18 irradiations. The *results* were gradual diminution of pain from the first to the fourth irradiation; absorption of hemorrhages; vision not improved; in 4 cases diminution of the tension; in all cases disappearance of pain; no enucleation.

(2) Brunetti treated 3 cases of hemorrhagic glaucoma, 1 case with inflammation of the retina caused by pregnancy. He administered 16 to 45 units by Holzknecht in 2 to 3 treatments over a period of 3 to 4 weeks. The *results* were: in the cases of hemorrhagic glaucoma, diminution of pain after 6 weeks; in the case with the inflammation of the retina, rapid diminution of pain.

(3) Gradle treated 9 cases of thrombosis of the trunk and 7 cases of thrombosis of the branches with 1/4 to 1/3 H.E.D. in 3 treatments. The *results* were: vision not improved; absorption not accelerated; but the method is suitable for the prevention of increased intraocular pressure.

(4) Hess treated 12 cases of absolute glaucoma and 3 cases of secondary glaucoma for 5 years. He administered 500r at 1 time in a frontal and a temporal field; total dosage to the eye 800r. The *results* were: after 4 to 6 weeks 12 patients free from pain; diminution of tension; 3 enucleations.

(5) Hessberg treated for 2 to 5 years 9 cases of hemorrhagic glaucoma. He administered 14 to 20 X with a filter of 2 to 4 Al at intervals of from 8 to 14 days; 2 to 4 treatments. The *results* were: absence of pain after the first or second treatment; in a few cases diminution of tension.

(6) Hoffmann treated for 2 to 5 years

4 cases of hemorrhagic, 9 cases of chronic, and 10 cases of secondary glaucoma. He administered for hemorrhagic and chronic glaucoma 540r with hard rays in 2 to 3 treatments for a week; for secondary glaucoma 360r within 2 to 3 weeks. The *results* were: diminution of pain but generally not of tension.

(7) Kreibig treated 10 cases of absolute glaucoma (only blind eyes). He administered 150r in 3 treatments with an interval from 1 to 2 days; series repeated after 1 to 2 weeks. The *results* were: diminution of pain (12 eyes); little diminution of tension.

(8) Saul treated for 1.5 years 3 cases of thrombosis of the trunk, 8 cases of thrombosis of the branches, and 7 cases of secondary glaucoma. He administered to blind eyes 50-percent H.E.D., to eyes with some vision 15- to 30-percent H.E.D. hard rays, at intervals of 2 days, 4 to 5 times. The *results* were: effects in most cases seen after the first irradiation; good results in 12 cases; subsequently 3 eyes had to be enucleated; tension not influenced.

(9) Schnyder and Forster treated 7 cases of thrombosis of the vein. They administered 40r medium-hard rays, 3mA, filter: 0.5 Zn + 1 mm. Al, 3 treatments at intervals of 2 to 3 days. The *results* were: quick absorption of the hemorrhages; vision increased.

(10) Thiel administered to blind eyes with absolute glaucoma 4 times 40- to 50-percent H.E.D.; to eyes with some vision 25- to 30-percent H.E.D. The *results* were: pain disappeared.

(11) Wachner treated 3 cases of acute, 30 cases of chronic, and 24 cases of secondary glaucoma. He administered 50r, 170 KV, filter: 3 mm. Al + 0.5 copper, 2 to 3 times a week; series repeated several times at intervals of a week. The *results* were: 68.4 percent eyes free from pain, 22.8 percent without success; 8.0 percent doubtful; irritation disappeared; tension not diminished.

(12) Zingale treated for 3 months 1 case of thrombosis of the trunk and 1 case of thrombosis of the branch. He administered 253E, filter: 1/2 Zn + 2 mm. Al, 4 to 5 treatments from 20 to 25 minutes, 2 series. The *results* were: improvement of the vision; absorption of the hemorrhages.

The cause of hemorrhagic glaucoma

The complete obstruction of the trunk of the central vein frequently causes hemorrhagic glaucoma with violent pain and blindness of the affected eye. However, if only a branch is blocked the danger of losing the sight, and later the eye, is less. Although it is rare to find manifest glaucoma after a single attack of obstruction of only one branch, the sight is always in danger, and the outbreak of glaucoma is to be feared. In my opinion, the explanation for this tendency to produce glaucoma is to be found in the difference in pressure between the two eyes. In the affected eye the tension is already somewhat higher at the beginning of the disease, even before glaucoma becomes manifest, and in spite of the use of miotics. Careful tonometric measurements of both eyes several times a day bring out this difference. Sometimes it is only evidenced after the use of a provocative test. The tolerance of the affected eye is less than that of the sound one, and the tonometric measurements appear 1 to 2 degrees higher in the affected eye.

Obstruction of the central vein can be the cause or the consequence of glaucoma. Many authors describe hemorrhagic glaucoma as a secondary one, but important findings make it probable that glaucoma is the primary event. Verhoeff was one of the first writers to point out that secondary obstruction of the central vein is more frequent than primary blocking.

Salzmann, using a special histologic method, found that in 65 enucleated and selected glaucomatous eyes, alterations of the central vein were often present and deduced from this fact that the obstruction was frequently caused by glaucoma. The influence on the venous circulation caused by the rising pressure and later by the manifest glaucoma is generally of a mechanical type. Because of this fact we can understand why thrombosis of the trunk of the vein will be produced earlier and more rapidly in glaucomatous eyes. The steps in the development of the disturbed venous circulation are: compression of the intralaminar part of the vein, thickening of the walls, and shrinking of the lumen, leading to thrombosis, and obliteration of the vein. The alterations present in the venous walls are always the same whether in a serious case or a lighter one, but the frequency of so-called secondary glaucoma diminishes with the increasing seriousness of the state of the central vein. Even a slight hindrance to the venous circulation can cause a slight increase of pressure. One may therefore speak of a "circulus vitiosus" between the impeded circulation and the glaucoma, so that the hindrance of the venous circulation involves a rise of tension, and the higher the tension the greater the difficulties for the circulation.

Effect of the X ray on the vegetative nervous system, the vessels of the retina, and the tension of the eyeball

The principal objective of therapy of glaucoma is to control the most threatening symptom; namely, the rise of intraocular pressure. It is certain that X rays have a special influence on the vessels, perhaps through a shrinking of the veins, but it is not easy to understand this mechanism clearly. The following opinions on this subject have been expressed by different authors.

(1) Basile—(a) a destructive effect of the sensitive nerve endings diminishes the pain; (b) a diminution of the tension is due to the production of an irritation and an inflammation of the uvea.

(2) Hess—influence on the circulation through the sympathetic nervous system.

(3) Hessberg—(a) an influence on the sensitive nervous system diminishes the pain; (b) an obliteration of the veins and the capillaries diminishes the tension.

(4) Kreibig—injury of the sensitive nervous system.

(5) Loewenstein and Reiser—increase of the "vis a tergo" and dilatation of the veins following hyperemia.

(6) Schnyder and Forster—(a) a dilatation of the central vein and the veins of the disc caused by hyperemia; (b) an increase of the "vis a tergo" in consequence of the simultaneous dilatation of capillaries.

(7) Wachner—injury of the sensitive nervous system.

(8) Weinstein—an influence on the vitreous; the glaucoma causes an increase of acidity due to an intumescence of a swollen vitreous.

The general effect of X rays is due to their influence on absorption, on the biologic reactions of the cellular activities, and on the radiosensibility of the cells. The normal development of cellular activity depends very much on a proper balance of the vegetative nervous system (VNS), which enmeshes all tissues, especially vessels. The radiosensibility, on the other hand, is controlled by the degree of irritability of the VNS. Different analyses performed by several authors point out that X rays have a remarkable influence on the VNS, consisting in a restitution of the normal function of the vasomotor nerves.

The relations between the sympathetic nervous system (VNS), the vessels of the retina, and the tension of the eyeball can be established in different ways:

(1) Experimenting on animals, Asher and Kajikawa found a relation between the permeability of the walls of the ocular vessels and the tonus of the VNS.

(2) Examining anatomically the short ciliary nerves, Ernyei found that their ganglion cells belong to the sympathetic ganglion of the carotid plexus, not to the ciliary ganglion, and that the nonmyelinated nerve fibers in the vicinity of the ciliary nerves are a direct continuation of the carotid plexus. Ernyei therefore concluded that the VNS has a great influence on the reflexes of the eyes, especially those of the ocular vessels and their mechanism.

(3) Thiel experimented pharmacologically with ergotamin (gynergen) which paralyzes the sympathetic nerves and diminishes the intraocular pressure. He stresses the fact that the influence of ergotamin on the vessels in the normal and the glaucomatous eye is due to a diminution of the permeability of these vessels.

(4) According to the experiments of Schoenberg the normal chemical process producing acetylcholine is disturbed in the glaucomatous eye. The result is an oversensibility with increasing esterase in the affected eye. That is, to fight glaucoma the endings of the parasympathetic nerves have to be irritated in order to restore these normal chemical processes and check the rise of an excess of esterase.

We can therefore assume that it is the VNS which is influenced by X rays in the following way: The first effect reaches the fine endings of the ciliary nerves of the sympathetic ganglion of the carotid plexus which itself influences the mechanism of the ocular vessels. The result is a remarkable diminution of the irritability of the affected eye with diminution of or even freedom from pain. Afterwards, the vessels, including the capillaries, become dilated, inflammation is reduced, nodes are reabsorbed, and cicatrization follows. If this process continues, the vessels reopen and the discharged substances are carried away. However, since X rays do not always have the same influence in every case, a careful dosage is necessary, according to: (1) the clinical state of the eye, (2) the purpose desired.

In many cases it is possible that a moderate application of X rays will have a rapid effect with good absorption, but in serious cases of severely damaged eyes, a blocked vessel trunk, and manifest glaucoma, a higher dosage is generally necessary. With the small doses of radiation that are sufficient for these eyes, it is practically impossible that the body should be affected.

Types of X rays and their effects on the ocular tissues

We have at our disposal weak, medium-hard, and hard X rays. Their influence on the different parts of the eyeball is shown by the figures in table 1. These figures are taken partly from Professor Reis's report, and were partly the results of my own experiments, conducted at my former hospital (Municipal Eye Hospital at Essen), which gave practically the same values. Weak rays are useful only for diseases in the vicinity and in the superficial parts of the eyeball. They become less efficient even directly under the superficial layers of the cornea. The influence of medium-hard rays extends throughout a larger zone, from the deeper parts of the cornea to the retina and the back of the eye. By changing the strength and the composition of the filter material one obtains many possible uses of mixed qualities of X rays. The kind of filter has to be adapted to the particular state of the disease to be treated. Hard rays are dangerous in this type of treatment because they have a deeper area of action and cannot be controlled in order to prevent severe injuries to the tissues of the eye. When using a medium-hard quality of

X rays in the treatment of uveal and retinal diseases, there is no danger in damaging healthy tissues because any part of the eye with balanced VNS will not be affected; that is, only pathologic tissues are radiosensitive.

Medium-hard rays are produced by a filter of 0.5 copper + 1.0 mm. aluminum.

TABLE 1

DEPTH OF PENETRATION OF X RAYS INTO THE EYE

In order to show the depth of penetration of the X rays into the eye, there is appended the diagram below.* The eye can be subjected to treatment of 3 different kinds of rays: weak, medium-hard,, and hard. The reader can see at a glance the influence of these different kinds of X-rays on the different parts of the eyeball. The effect of weak rays on the uvea and the retina is slight, of hard rays too strong. Therefore, I prefer medium-hard rays for the treatment of the diseases in question.

Mm.	Weak Rays	Medium-hard Rays	Hard Rays
0	100	100	100
5	55		105
10	40		
15	30	100	
20	25		
25	21	95	105
30	18	90	100

* Diagram and figures are reprinted from "Traité d'Ophtalmologie," volume viii, page 211, with the permission of the author, Prof. Reis, formerly at Strasbourg (France) and the publishers Masson et Cie, Paris. (This diagram also appeared in the writer's paper published by the Schweiz. med. Woch., Bale, 1940, v. 94, p. 954.)

The irradiation causes a diminution of the irritability of the VNS. The effects are as follows: (1) mitigation of pain brought about by a change in the cell function and in the tension of the tissue; (2) cicatrization of the pathologic area—small doses bring about an irritation followed by retrogression and regeneration; larger ones cause production of connective tissue and shrinking of the vessels; (3) absorption of hemorrhages and improvement of blood circulation; (4) regulation of the intraocular pressure—the tension falls, more or less, in cases of hypertensive iridocyclitis, and in cases of iridocyclitis with hypotonia the tension rises.

The effect of X rays begins immediately after the first irradiation. According to findings by David and Gabriel, the reaction of X rays can be seen with the capillary microscope a few days before it is observable macroscopically.

The danger of an erythema of the skin of the eyelid is less with medium-hard rays than with weak ones. The intervals between the different applications of irradiation must be fixed according to the gravity of the disease and the individual sensibility, varying from 2 to 8 days or 2 to 8 weeks. The irradiation should end when its purpose is achieved. The necessary quantity of X rays is called "the total dosage of influence" and it should be adapted to the particular case treated. The definite effect of X rays often comes later. One must be careful to avoid an overdosage whose influence is unknown, waiting a certain period before the results are attained, and not be discouraged if this effect is delayed.

SEVERAL TYPES OF IRIDOCYCLITIS

TUBERCULOUS IRIDOCYCLITIS

The types of uveitis that respond best to treatment with X rays are tuberculous, traumatic, and hypertensive iridocyclitis. In tuberculosis of the iris and of the ciliary body one must be especially careful because of the great sensitivity of these pathologic tissues, otherwise there is danger of making things worse by causing a stronger irritation or even by injuring the sight. Most of the writers indicate a preference for small doses at shorter or longer intervals. The methods of a few ophthalmologists which I consider of a fundamental importance are the following:

(1) Werdenberg-Davos (Switzerland) used a type of X rays a medium between weak and medium-hard rays. The first single dose is 2.5- to 5-percent H.E.D. The total dose is 20-percent H.E.D.; the total dosage a year is 60-percent H.E.D.; the intervals are days or weeks according to the state and the reaction. He intended to prevent early reactions and injuries by X rays. Of 3,000 treatments by X rays he saw only 4- to 5-percent reactions.

(2) Stock and Scheerer used hard rays with 20-percent H.E.D. as a single dose, no more than 60-percent H.E.D. a year. The irradiations are given at intervals of 6 weeks without injuries or undesired reactions.

(3) Negru and Michael used medium-hard X rays with 50r as a single dose three times up to 150r as total dosage. The irradiations are given at intervals of 4 days; if necessary repetition of the series after 6 weeks.

As for myself, I used medium-hard X rays with 12 to 15r as the first single dose up to 50r; total dosage a year 300r (60-percent H.E.D.) the irradiations are given at intervals of 4 to 8 days, the later ones at 4 to 8 weeks' or months' intervals. Most important is a careful selection of the cases and exact regulation of the dosage and the intervals after each treatment. I have observed the best effect with the use of protracted and fractioned small doses. The ophthalmologist should always indicate to the roentgenologist the dose that is desired in every case. If the patient stands this dosage, injury to the eye will probably be impossible. It must be remembered that in comparing one's own results with those of other writers the different types of diseases and also the environment in other countries must be taken into account. Furthermore, the X-ray treatment is only a part of the complete treatment and is aided by the other special and usual remedies.

In case of tuberculous iridocyclitis the ocular reactions to the different treatments and also to the X rays are extremely sensitive, resembling the common therapy with tuberculin. The best results are found in the productive forms of the tuberculous iris. In the secondary stages of the illness, especially in the later periods, the effect is less, and in the exudative forms results are uncertain and undesired reactions possible. Often the patient feels a relief in the affected eye almost immediately after the first irradiation, but normally improvement will be noted a few days later. If the tuberculous uveitis reaches the deeper parts of the ocular tissue, X-ray treatment becomes uncertain and even unsuccessful.

Hypertensive iridocyclitis

One of the most dangerous complications of the various types of iridocyclitis and especially of the chronic forms is the appearance of a sustained hypertension. Often none of the numerous conservative and surgical treatments are strong enough to regulate the pressure. The rise in tension is due to productive and exudative eruptions as well as to small thromboses. In such cases the doses of X rays have to be higher, especially if the eye is already blind. Complete normalization of the tension is not necessary to quiet the blind eye. A relative diminution may be sufficient to end the inflammation and the pain.

Traumatic iridocyclitis

Iridocyclitis of traumatic origin holds a special position among the different types of iridocyclitis. Serious injuries of the eye, such as perforation of corneal or sclerotic tissues by a foreign body, are generally accompanied by posttraumatic iridocyclitis in spite of careful surgical treatment of the wound and the extraction of the foreign body immediately after the accident. The gravity and the extent

of the iridocyclitis depend on the injury, on the infection brought about by the perforation, and the foreign body. Many such eyes have to be enucleated. It is obvious that there is danger of sympathetic ophthalmia in every case. A great many ophthalmologists, therefore, prefer an early enucleation, particularly in cases of extensive injuries where there is no hope of saving any sight. Although I fully realized the justification for this point of view, I felt that I should try to conserve these eyes as long as it was possible without danger of an outbreak of sympathetic ophthalmia. Particularly if children become blind in one eye by an accident, the growth of the skull goes on more regularly and symmetrically on both sides of the face if the orbit is not empty. It seems to me therefore of considerable advantage to save such eyes for a certain time, at least, if not for ever. Wearing a glass eye is not the same as possessing one's own painless eyeball; one is blind, to be sure, but makes a good appearance. Even if the quieted eyeball has shrunk, a glass eye worn over it looks and moves better than one worn in the empty orbit.

The earlier the irradiation begins, counting from the first day of the injury, the better the effect. I therefore systematically apply in such cases an early protracted and fractioned X-ray treatment after the first surgical care. By doing this it is attempted (1) to retain the shape of the seriously injured eyeball; (2) to conserve the actual sight. The doses in this type of iridocyclitis have to be higher than for other types of iridocyclitis and given at shorter intervals. The first irradiation is given from the 3d to the 6th day after the injury with 50r to 100r of medium-hard type of X rays. According to the special conditions of the particular case this dosage is repeated once or twice, or, if possible, 25 to 50r is given between the 3d and the 10th day after the first irradiation. On an average quieting the injured eye takes a total of 150 to 300r. There is no danger in approaching the higher limit of compatibility, even in reaching the maximum dose.

Figures and Cases of Posttraumatic Iridocyclitis

In my former hospital, situated in the middle of a large industrial district, I had to handle continuously many severe ocular injuries due to industrial accidents. This gave me the opportunity of testing the method described. In 1924 I reported the results of 44 such cases: 60 percent of the eyes were quieted, 23 percent had to be enucleated. From then to 1933 I continued using X rays for a large number of ocular injuries and obtained good results. Conditions at the time prevented me from reporting the figures. In 1939 and 1940 I was able to use the method in 8 cases at the University Eye Hospital at Lausanne* (Switzerland, Director: Professor Amsler). I wish to take this opportunity to express my sincerest thanks to Professor Amsler for his understanding help and permission to use my method. Short excerpts from the case-notes are as follows:

Case 1. Jean V., 40 years old, on September 17, 1939, sustained a perforating injury of the left eye by a foreign body (iron) which produced a double perforation of the eyeball and became embedded behind the eye in the orbit. Severe hemorrhage in the interior of the eye. No red reflex from the eye. Projection of light uncertain. Posttraumatic iridocyclitis. In view of the situation of the foreign body in the orbit without contact with the eyeball, an attempt to extract the foreign body was abandoned.

Irradiation: September 29th, 50r.

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* Presented at the meeting on February 25, 1940, of the "Groupe Ophtalmologique du Léman" at the Hôpital Ophtalmique at Lausanne (Switzerland) together with a demonstration of the treated patients. Published in the "Schweiz. med. Wochenschrift 1940, v. 94, p. 954.

Results: October 10th, the injured eye became pale; iridocyclitis in a state of retrogression; no pain in the eye when touched. The patient had to leave the hospital for personal reasons and the irradiation was therefore interrupted, remaining incomplete. February 16, 1940. The left eye free from irritation and pain; tension low; the right eye normal without any sign of irritation.

Conclusions: This is an incomplete and insufficiently treated case, only mentioned as one of the whole series; nevertheless a certain influence of the irradiation can be admitted since the retrogression of the iridocyclitis and the quieting of the eye would probably not have occurred so quickly without this treatment.

CASE 2. Paul P., 49 years old, on September 25, 1939, sustained a severe perforating injury of the right eye by a large foreign body (iron) which did not enter the interior of the eye. Shortly after the injury there developed a violent posttraumatic iridocyclitis and an abscess in the vitreous. The eye was soft and painful when touched.

Irradiation: October 2d, 50r; October 5th, 50r; October 8th, 25r, at 3 days' intervals; total dosage, 125r.

Results: The irradiation had no effect; therefore, on October 10th, the eye was enucleated.

Conclusions: The section of the eyeball showed that there was a large horizontal tear through the cornea and sclerotic reaching the equator of the eye. The lips of the sclerotic wound were not adapted, but overlapped; hence healing of the wound was impossible and X-ray irradiation could be of no use.

CASE 3. Henri B., nine years old, on January 28, 1939, sustained a perforating injury of the left cornea by a knife stab. There existed a prolapse of the iris which was cut off immediately after the event, and the lips of the wound were sutured. In spite of a satisfactory healing of the external wound, iridocyclitis slowly set in. I saw the boy in this state during the first days of October, as he was being prepared for an enucleation. Irradiation with X rays, a long time after the injury had occurred, could only be a last attempt to conserve the eyeball in its shape for a few years, preventing trouble to the orbit and the face during the years of growth.

Irradiation: October 10th, 50r; October 13th, 50r; October 21st, 50r; October 24th, 50r; at intervals from 3 to 8 days; total dosage, 200r.

Results: Since the iridocyclitis and pain in the eye when touched remained, the eyeball had to be enucleated.

CASE 4. Josef D., 38 years old, on December 6, 1939, sustained a perforating injury of the sclerotic of the left eye without entrance of the foreign body. Suture of the wound. Posttraumatic iridocyclitis, pain in the eye when touched, low tension.

Irradiation: December 8th, 100r; December 13th, 100r; December 21st, 100r; December 30th, 50r; at intervals from 5 to 8 days; total dosage, 350r.

Results: January 10, 1940. Left eye pale and quiet. Cicatrization of the iridocyclitis. A little shrinking of the eyeball is seen. Tension still somewhat subnormal. No pain in the eye when touched. March 20, 1940. State unchanged. The eye remains pale and quiet. The patient is back at work.

CASE 5. Innocent P., 43 years old, on December 16, 1939, sustained a perforating injury of the left eye by a large foreign body (iron). Extraction of the splinter by means of the giant magnet. Shortly following the operation there developed a violent posttraumatic iridocyclitis with an hypopyon in the anterior chamber and an abscess in the vitreous. The eye became soft and very painful when touched.

Irradiation: December 26th, 50r; January 24, 1940, 50r; January 11th, 50r; January 17th, 50r; January 24th, 50r, at intervals from 6 days to 5 weeks; total dosage, 250r.

Results: The hypopyon in the anterior chamber and the abscess in the vitreous was reabsorbed very quickly. The eye became pale and quiet. Cicatrization of the iridocyclitis was seen. Tension rose. February 24, 1940. To make sure of the effect an additional irradiation of 50r was given 5 weeks after the last day of the series. April 30, 1940. The left eye showed no inflammation and remained quiet. No pain in the eye when touched. Iridocyclitis clinically healed. The patient works at his former job.

CASE 6. Léon B., 27 years old, on January 18, 1940, sustained a perforating injury of the left eye. No foreign body in the eye. Violent posttraumatic iridocyclitis. The eye become soft and painful when touched.

Irradiation: January 18th, 50r; January 22d, 25r; February 1st, 50r; February 11th, 50r, at intervals from 4 to 10 days; total dosage, 175r.

Results: The eye became pale and quiet. Cicatrization of the posttraumatic iridocyclitis occurred. The anterior part of the eyeball shrunk a little. Tension somewhat reduced. No pain in the eye when touched. The patient is back at work.

CASE 7. Oliver J., 47 years old, on March 15, 1940, sustained a perforating injury of the sclerotic of the left eye by a foreign body

(glass). Suture of the lips of the wound. Whether a foreign body remained in the interior of the eye or not was uncertain. The splinter of glass was not visible in the radiogram. Violent posttraumatic iridocyclitis with an hypopyon in the anterior chamber. The eye became very soft and painful when touched. There was only perception of light.

Irradiation: March 27th, 50r; March 29th, 25r; April 4th, 50r, at intervals of 2 to 18 days; total dosage, 125r.

Results: March 30th, the left eye had become pale and quiet. Hypopyon in the anterior chamber was reabsorbed. Precipitates on Descemet's membrane were seen. Cicatrization of the posttraumatic iridocyclitis occurred. Opacities in the vitreous. The fundus was invisible. Tension still low. Visual acuity, 1/20. May 1st, the injured eye remained pale; precipitates unchanged; the vitreous less opaque; tension normal; no pain in the eye when touched. Visual acuity, 0.3; the patient works at his former job.

CASE 8. Marcel E., 20 years old, on April 4, 1940, sustained a perforating injury to the cornea of the right eye with a prolapse of the iris. No foreign body in the eye. That same day the prolapse was cut away, and the lips of the wound were sutured. There was a big hyphema in the anterior chamber and a traumatic cataract was seen. The eye became soft and painful when touched. Visual acuity, perception of fingers at 1 m.

Irradiation: April 20th, 50r; May 3d, 50r, at an interval of 12 days; total dosage, 100r.

Results: April 30th, the injured eye became pale and quiet; the hyphema was on the way to resorption; the tension was rising and the pain in the eye when touched diminishing; visual acuity, fingers at 3 m. May 10th, the recovery continued; the irradiation was interrupted by external causes and had to be repeated to make sure that the first satisfactory effect would be maintained.

SUMMARY. The eight cases of posttraumatic iridocyclitis herein discussed were observed by me in the University Eye Hospital at Lausanne (Switzerland) from September, 1939, to April, 1940. During this period all cases of new or old perforating ocular wounds observed at the Hospital were given the X-ray treatment at random regardless of the effect it might have. I made an early report of such a limited series for I wished to present them at the meeting in February, 1940. Later on, conditions at the time prevented me from supplementing the case-notes with the later clinical observations. In spite of these facts I deem these few and abbreviated case-notes of sufficient value to demonstrate the possibilities and the limits of the method. They represent seriously injured eyes, some of them accompanied by great loss of vitreous, violent posttraumatic inflammation, and purulent infiltration of the vitreous, which would have had to be enucleated if their condition had not been ameliorated by the X-ray treatment. Only in two cases was this operation necessary:

(1) In case 2, it was seen at the section of the enucleated eyeball that the wound presented unfavorable conditions for healing; therefore X-ray therapy was useless.

(2) In case 3, the injury was too old to permit any result from X rays to be obtained; on the other hand, the danger of sympathetic ophthalmia urgently demanded enucleation.

(3) In cases 4, 5, 6, the effect of the X-ray treatment was very satisfactory and in spite of severe inflammations of the injured eye enucleation was unnecessary.

(4) Particularly remarkable was case 7. The patient was a chauffeur by profession, and for him the continuation in his profession depended on the conservation of the injured eye with some sight. It seems to me to be more than doubtful whether such good results as normal tension and visual acuity of 0.3 were to be obtained by any other treatment than X rays.

(5) The treatment in cases 1 and 8 remained incomplete at the time when I had to finish my observations. Although supplementary irradiations are desirable, one can note the good effects of the X-ray treatment also in this state.

General results of X-ray treatment on posttraumatic iridocyclitis

The results of X-ray treatment on posttraumatic iridocyclitis consist of: disappearance of the redness of the anterior part of the eyeball, diminution of inflammation, cicatrization, painlessness in the eye when touched, and a certain rise of pressure in cases of low tension. A complete normalization of the tension is not to be expected. If the eye has become quiet, one may speak of a clinical healing, and if good projection of light remains it is possible to operate later on, if necessary. It seems to me impossible that X-ray treatment by itself should cause sympathetic ophthalmia. On the other hand, to prevent sympathetic ophthalmia regular and careful examinations by an ophthalmologist are absolutely necessary. X-ray treatment should be tried only when the patient can reach his ophthalmologist quickly and easily. If not, early enucleation of the inflamed and injured eye is to be preferred.

X-ray treatment for thrombosis of the retinal vein

In cases of thrombosis of the trunk or of the branches of the central retinal vein I use X-ray treatment immediately after the first consultation. I assume that in all such cases glaucoma can easily set in sooner or later. The preservation of sight depends on the extent of the thrombosis and on the tension in the eye. In cases of trunk thrombosis, generally, blindness cannot be prevented, but thrombosis of the branches can be arrested, and perhaps the vision can be maintained or even improved. If X rays are used with correct dosage and systematically, it is possible in all glaucomatous cases to make the severe pain disappear and prevent enucleation. The regulation of the tension is of more relative value. Normal tension is not necessary to quiet the irritability since chronic glaucoma can exist without any pain. The dosage for trunk and branch thrombosis must be different; it varies from 350 to 450r in the first instance and from 150 to 200r in the second. If pain and inflammation are violent the intervals between irradiations must be reduced by accelerating the rhythm of the treatment. In cases of complete obstruction of the venous trunk with glaucoma, X-ray treatment is completed when the eye has become quiet, and in cases of a partially blocked branch at the moment when the bleeding has stopped and an absorption of blood can be observed. Usually four to five applications are sufficient for this purpose. The scheme of these irradiations, using medium-hard rays and a filter of 0.5 copper and 1 mm. aluminum is seen in table 2.

If irritation of the external parts of the eye appears together with erythema of the skin of the eyelid and a more intensive injection of the conjunctival vessels, X-ray therapy should be discontinued until the irritation is over. The effect of the irradiation can be intensified in the weeks and months following; therefore, a definite judgment about the results attained is only possible after a long time. It seems best to me to reach the desired effect with the smallest possible quantity of X rays, but "too much" is as dangerous as "too little," and only by the use of correct combinations of dosage and intervals can we expect good results. The vessels are dilated or constricted under the influence of X rays. Dilatation is caused by irritative doses from 25 to 50r, generally totaling no more than 150 to 200r. This is important, especially in branch thrombosis when blood has to be absorbed as soon as possible to prevent early damage to the retina. Hence, to favor this we have to render the veins capable of transporting the thrombus before the retina is seriously af-

fected. In cases of trunk thrombosis only constriction doses can quiet the eye. Frequently a certain dosage must be used that can bring about the state of complete obliteration of the vein. Generally, a total of 350 to 450r is necessary. One need not fear general complications in the body, since the single doses for the eye are too small for such remote effect. It must be added that it is always useful to have a general medical and internal examination, made by an internist in collaboration with the oculist, also a careful general treatment, if necessary, since it is a known fact (which no longer needs to be stressed) that the principal causes of these ocular diseases are always to be found in the body.

TABLE 2

I. THE PROTRACTED AND FRACTIONED EARLY IRRADIATION

Diagnosis	Single Dose	Intervals	Total Dosage
Posttraumatic iridocyclitis	1st treatment: 50 to 100r	3 to 10 days	
	2d treatment: 50 to 100r		
	3d treatment: 50r	3 to 10 days	150 to 300r
	If an improvement is seen		
	4th treatment: 50 to 25r	2 to 4 weeks	
	later on: 25r		
Thrombosis of the retinal vein			
(a) of the trunk	1st treatment: 50 to 100r		
	2d treatment: 50 to 100r	5 to 10 days	
	3d treatment: 50 to 100r		
	If an improvement is seen		350 to 450 r
	4th treatment: 50 to 25r	greater inter-	
	later on: 25r	vals	
(b) of the branch	1st treatment: 50r	5 to 10 days	
	2d treatment: 50 to 25r		
	3d treatment: 25 to 15r	greater inter-	150 to 200r
	later on: 15 to 10r	vals	

II. THE PROTRACTED AND FRACTIONED IRRADIATION AT A SPECIAL TIME ACCORDING TO THE STATE OF THE DISEASE

Tuberculous	1st treatment: 12 to 15r	4 to 8 days	
	If the 1st treatment is tolerated and the disease needs further treatment		
	2d treatment: 25 to 50r	4 to 8 weeks	no more than
	3d treatment: 25 to 50r	or months	300r a year
Hypertensive (glaucomatous) iridocyclitis	1st treatment: 50 to 100r		
	2d treatment: 50 to 100r	3 to 8 days	
	3d treatment: 50 to 25r	8 to 14 days	125 to 300r
	later on: 25r		
	(if necessary)		

CONCLUSIONS

1. X-ray treatment for the ocular diseases under discussion should be given at the earliest moment possible; namely, (a) in cases of injuries immediately or in the first days after the injury or after the first surgical care; (b) in cases of thrombosis of the retinal vein after the first examination; (c) in cases of tuberculous and hypertensive iridocyclitis the decision as to the best moment for irradiation depends on the state of the injured eye.

2. X-ray treatment is best administered in protracted and fractioned small doses.

3. X-ray treatment has to be carried through systematically to the end, even if one has to wait longer than usual for good results.

Finally I wish again to point out that X-ray treatment of the ocular diseases under discussion must always be performed in close coöperation between ophthalmologist and roentgenologist. Both have to consider diagnosis and appropriate moment for the X-ray treatment in every case, the technical requirements necessary, and the patient's compatibility for this treatment. If all conditions are present, I believe that it would be possible to heal many serious diseases, to conserve eyes otherwise lost, and to aid a large number of sufferers.

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ALMOST COMPLETE RETINAL DETACHMENT AFTER CATARACT EXTRACTION; COMPLETE REATTACHMENT AFTER GLAUCOMA ATTACK

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Spontaneous reattachment of detached retinas has been reported by numerous observers.[1] In fact the majority of ophthalmologists probably have seen such cases occasionally. The reattachment is sometimes only temporary, sometimes permanent. A number of cases have been reported in which detachment recurred repeatedly, always followed by reattachment sooner or later without surgical procedure and sometimes without any treatment whatsoever. Frequently, a considerable amount of function returned in the involved eye, although a permanent defect of vision and defects in the visual field resulted in most cases wherein the detachment had persisted over longer periods.

It is also well known that in many cases of retinal detachment variation of the intraocular pressure may be observed fairly regularly. Some observers have insisted that the tension was below normal as a rule almost immediately after the start of the detachment whereas others have found a drop in tension only after a considerable time has elapsed. On the other hand, it seems to be a well-established fact that in a fair number of cases of untreated retinal detachment, secondary glaucoma develops in the later stages of the disorder.

In spite of the tremendous amount of research work carried out during the past century, no completely satisfactory explanation has been given for either of the two processes; that is, for spontaneous reattachment or for the occurrence of secondary glaucoma following retinal detachment. Only in cases wherein the retinal detachment is caused by a true exudation behind the retina (or, better, between the pigment layer and the retina proper)—for example, as in those occurring during pregnancy—is a reattachment fairly plausibly explained by resorption of the fluid by the choroid.

Since the publication of Leber's[2] very elaborate studies it has been a well-established fact that the formation of holes or tears in the retina itself or rents at the ora serrata plays a predominant part in the mechanism of retinal detachment by allowing fluid from the vitreous body to penetrate behind the retina. Recognition of the fact that the closure of such apertures by means of coagulation and reactive proliferation of scar tissue is of paramount importance led Gonin and many others (particularly Weve, Arruga, Lindner, and Walker) to develop modern methods of active treatment of this formerly hopeless disorder. It is true that the old conservative treatment with bed rest, pressure bandages, subconjunctival injections of hypertonic solutions and the like, had been used with some success in a limited number of cases. Fehr[3] believed that mechanical reduction of the size of the globe did help to bring the detached membrane into closer contact with the pigment layers, thus inducing reattachment. Since there is usually a free communication between the subretinal and the vitreous fluid through one or more openings in the detached retina it seems difficult to understand why pressure exerted upon the surface of the globe should bring the retina back into place unless some agent—that is, an inflammatory process—occludes the retinal hole through which the exchange of fluid takes place at the right

moment and the subretinal fluid is subsequently absorbed. There is no doubt that pressure bandages and similar appliances, such as plugs inserted into the conjunctival sac, invariably cause a rather violent inflammatory reaction with considerable reduction of the intraocular pressure, and it may be that these reactions play a more important part than the external pressure itself. Equally uncertain is the origin of secondary glaucoma in the later stages of retinal detachment. We know that a tendency to proliferation exists in the pigment epithelium when the retina is detached. The pigment layer grows considerably thicker, and large quantities of free pigment are deposited on the surface of the iris and in the chamber angle. This might cause an obstruction of intraocular exchange of fluid and lead to an increase of intraocular pressure. However, since the pigment accumulation in the anterior section of the globe usually occurs in the earlier stages, the development of a secondary glaucoma years after the detachment of the retina, rather than shortly after it, is not easily explained.

The literature contains a very few records of cases in which a spontaneous secondary increase in intraocular pressure caused flattening or reattachment of the retinal detachment. Attempts have been made to increase the volume of the vitreous artificially by injecting salt solutions or foreign vitreous materials[4] into the vitreous chamber after puncture or trephining of the sclera to release the subretinal fluid. It was assumed that the increase of pressure by the vitreous would bring the retina into contact with the choroid, and in a number of cases such procedures proved successful.

In 1928 Sédan[5] reported one case of an eye, affected by a chronic recurrent syphilitic iritis, which sustained a large retinal detachment after being hit by a tennis ball. The eye showed total seclusio pupillae and developed a large retinal detachment with no visible holes. During the conservative treatment an acute secondary glaucoma started on the thirty-eighth day, accompanied by iris bombé. After double transfixation the tension came down to normal, and the retina became almost completely reattached, with the exception of a small area below, where a flat detachment remained. After three months the corrected vision was about 5/10 (as before) and the field of vision had returned to approximately normal limits. But this seems to be about the only case published so far wherein secondary glaucoma in an eye with retinal detachment apparently had a beneficial effect as to anatomic and functional repair of retinal detachment. Obviously such cases are extremely rare and I could not find any record of a case which, after an extensive retinal detachment that had persisted for a considerable length of time, developed acute glaucoma and manifested a complete recovery of function after the glaucoma attack subsided and the retina became reattached.

I have had the opportunity of observing such a case and feel justified in bringing it to the attention of my colleagues, particularly since it presents a number of unusual features.

Case report

H. T. W., a white farmer, 80 years old, consulted me for the first time on June 25, 1943, with the following history:

The patient had been quite well until 1925, when some intestinal trouble of uncertain nature eventually required surgical treatment. In September, 1925, the patient was operated upon for a duodenal ulcer. The operation was performed under ether anesthesia, during which apparently a complication occurred which the patient was unable to identify properly.

The anesthetist had "a hard time to bring him back." The day after the operation the patient noticed that his left eye had become blind. Curiously enough the patient did not tell his doctors anything about this incident. The hospital record does not contain any remark as to complications occurring during the operation or after it. Nor does it mention anything about the patient's monocular blindness. After a while some sight came back to the left eye, to the degree that the patient could distinguish between darkness and light. Later on visual acuity in his right eye decreased gradually, and about five years ago he consulted an oculist, who told him that he had a cataract in the left eye and prescribed drops for the right eye (pilocarpine?), which he used regularly, at least for some time. Nevertheless, the right eye continued to get worse gradually, and in November, 1942, the patient consulted another oculist, who advised and performed at that time the removal of the cataract in the left eye. The hospital record indicates that intracapsular combined extraction of a hypermature, senile, calcareous cataract was performed on November 17, 1942; that the operation was not complicated; and that the anterior chamber was irrigated with saline solution after the extraction. No vitreous was lost during the operation. The patient could see with the eye that had been operated on for some time, and a lens for distance was prescribed. However, the vision became gradually poorer after some weeks. The deterioration was accompanied by constant inflammation of the operated eye. Eventually the patient was taken to the hospital again on April 9, 1943, and advised to lie on his left side for some days. The hospital record on the second admission shows a diagnosis of "high detachment of the choroid, especially temporally and below." When the patient was released on April 19, 1943, the detachment was "still high." The eye was practically blind. Gradually, the eye became more inflamed and painful but supposedly the patient received no further treatment until he came to me.

At my examination on June 23, 1943, the right eye was externally normal and showed no signs of congestion or inflammation. The cornea was clear, the anterior chamber somewhat shallow, the pupil was about 3 mm. wide and reacted promptly to light but not extensively. The lens showed moderate sclerosis but no cataract. Ophthalmoscopic examination revealed a very deep glaucomatous excavation and almost complete atrophy of the optic disc. The intraocular pressure was above normal.

The left eye was moderately congested and showed pericorneal injection. The corneal surface was smooth and reflected normally. In the region of the upper limbus a slightly depressed scar (from cataract operation) formed a shallow furrow between the limbus itself and a somewhat protruding area of the sclera parallel to the scar resulting from the operation. Ingrowth of epithelium had formed a fairly dense gray film at the upper part of the posterior surface of the cornea, with a tongue-shaped process in front of the center of the iris coloboma extending downward about halfway between the center of the cornea and the chamber angle. The anterior chamber was very shallow, almost obliterated in the upper third, where the nasal and part of the temporal pillar of the iris coloboma was attached to the rear surface of the cornea. The chamber fluid contained some floating cells, but no precipitates were visible. The iris was slightly discolored and hyperemic. A very delicate membrane was attached to the pupillary margin, spreading upward into the medium-sized operative coloboma. The lens was absent.

Ophthalmoscopic examination revealed

almost total detachment of the retina with the highest elevation in the temporal section. The detachment reached almost to the median vertical plane, was also high in the lower section, and extended almost to the optic disc, apparently also involving the macular region. In the nasal section the detachment was much flatter. Holes or tears could not be detected. However, the somewhat narrow pupil and the partial obscuration of the cornea prevented sufficiently thorough examination of the peripheral parts of the fundus.

In the left field gross objects were seen in a limited temporal area. Central vision was nil (fig. 1).

Diagnosis: O.D., advanced glaucoma simplex. O.S., aphakia; postoperative retinal detachment, mild uveitis with hypotension.

On June 28, 1943, the condition was about the same, the tension in the right eye 28 mm. Hg. Repeated instillation of 2-percent pilocarpine hydrochloride brought the pressure down to 19 mm. Hg. The patient was advised to use this solu-

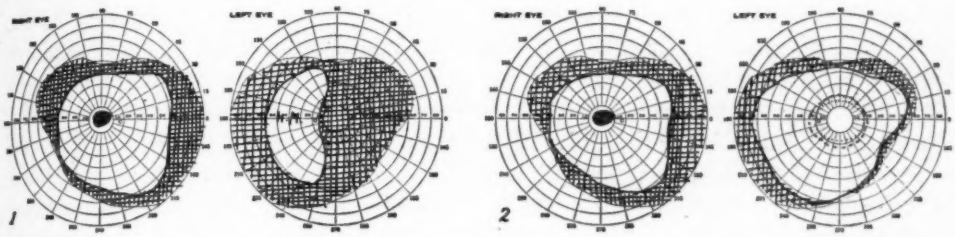

Fig. 1 (Nelson). Visual fields as of June 28, 1943. Fig. 2, Visual fields as of October 8, 1943. Dotted line, red; dash, blue.

The detachment was definitely retinal and not choroidal, showing the characteristic gray color. The optic disc was of normal color and apparently not excavated. Instillation of fluorescein revealed no leakage nor fistula in the operative wound or elsewhere.

Tension, measured with the Schiötz tonometer, using 5.5 gm. weight: right eye 30 mm. Hg, left eye less than 5 mm. Hg.

Vision: O.D., 5/100, not improved with glasses; O.S., with +10.0D. sph. was sufficient only for finger counting at 1 m. distance, excentrically, in the temporal field alone.

The right peripheral field of vision was only moderately concentrically contracted for white objects (10 mm.²) Colors were not recognized. The central field showed a scotoma of not quite 10 degrees.

tion in the right eye three times daily. On July 6th the tension in the right eye was down to 17 mm. Hg. The left eye was less tender and inflamed but still as soft as before.

Since the prognosis for the left aphakic and highly hypotonic eye with the large detachment that obviously had started five or six months ago was extremely dubious it did not seem advisable to try a diathermy operation, the advanced age of the patient (80 years) being another grave obstacle. It was therefore decided to concentrate on the right glaucomatous eye that responded very well to mydriatics and enabled the patient to get around fairly well.

On the morning of July 12, 1943, the patient, who lives out of town, returned because the preceding evening his left eye had suddenly become very painful and inflamed. It was very congested, sensitive

to light, and hard, showing the complete picture of an acute inflammatory glaucoma. The cornea was hazy, the conjunctiva bulbi moderately chemotic. Tension was 57 mm. Hg (Schiötz) in the left eye, 19 mm. Hg in the right eye. Two-percent pilocarpine hydrochloride was instilled into the left eye immediately and repeatedly, and after one hour the tension came down to 35 mm. Hg. At 2 p.m. it was again up to 48 mm. Hg. The patient was advised to put one drop of the same solution into his left eye every hour. The next morning he felt much better, and the left eye no longer pained him. The tension was O.S. 19 mm. Hg, but the eye still showed considerable congestion. The patient instilled the pilocarpine solution 3 times daily and felt comfortable. Two weeks later the left eye was still slightly irritated but the tension was again 19 mm. Hg. On August 25th both eyes were quiet and the tension was O.D. 18 mm. Hg, O.S. 20 mm. Hg.

On October 1st the patient returned for another check-up. The condition of the right eye was unchanged. The left eye showed a very faint diffuse episcleral injection, but was no longer tender to the touch. Tension O.D. 22 mm. Hg; O.S. 22 mm. Hg. The patient seemed to move about much more freely and surely. When I examined his left eye with the ophthalmoscope I was greatly surprised to find a normal bright red reflex from all over the fundus. The detachment of the retina had completely disappeared, not even folds of the retina could be detected at any place. My question if the patient had noticed a remarkable improvement of vision in the left eye was answered in the affirmative. As a matter of fact the vision of the left eye with +10.5D. sph. ⊂⊃ +2.5D. cyl. ax. 180° was now 5/10 partly; with +14.0D. sph. ⊂⊃ +2.5D. cyl. ax. 180° the patient could read Jaeger 5. On October 8th the vision with the same correction was 5/6− and Jaeger 1. In the right eye the field of vision was unchanged. The left field, however, was almost normal for 10-mm.² gray objects. The color field was present for all colors although considerably contracted concentrically (fig. 2).

Since a change in the refraction of the left eye could hardly be expected in the future a bifocal lens with the refraction mentioned above was prescribed. On November 30th the corrected vision was O.D. 5/75, O.S. 5/5 partly and Jaeger 1. The left fundus showed absolutely no trace of the previous retinal detachment. A number of floating opacities could be seen in the vitreous body. The anterior chamber was still as shallow as before. The condition has since remained unchanged. The tension in both eyes varied between 19 and 22 mm. Hg. When tested last on December 14, 1943, the color fields were about 10 degrees wider than on October 1.

It does not seem very probable that the diagnosis "choroidal detachment" was correct. Postoperative separations of the choroid after cataract and glaucoma operations are not uncommon. However, almost all experienced observers agree that such an event usually occurs earlier, one day to a week after the operation, most frequently on the fifth day, and that, as a rule, spontaneous reattachment takes place after short duration. If a choroidal detachment persists for any length of time it is often a hemorrhagic detachment, which generally leads to shrinkage and destruction of the globe. Czermak[6] reported a choroidal detachment several months after a cataract operation. One case has been described by Bothman,[7] in which a choroidal detachment persisted eight months after an Elliot trephining operation and was cured after transplantation of a piece of tendon over the leakage. Löhlein[8] reported another case in

which choroidal detachment occurred nine months after a cataract extraction. A leak was found also in this case, and healed with cauterization of the fistula and transplantation of a conjunctival flap.

In incline to the view that our patient's eye underwent a primary retinal and not a choroidal detachment. No fistula could be found at any time in the scar with the fluorescein method and slitlamp examination. A choroidal detachment was particularly unlikely as the detached membrane showed a very high elevation in the entire temporal and lower sections of the eyeground, and the elevation included the whole area from the extreme periphery to the close vicinity of the optic disc. Separation of the choroid to such an extent would be impossible without severance of at least the temporal and lower vortex veins. Such severance would inevitably result in a disastrous and irreparable subchoroidal hemorrhage.

It seems improbable that reattachment of the retina after the severe attack of glaucoma was merely coincidental. I am inclined to believe that there was a causal connection between the two events. However, I admit that I am not able to give a fully satisfactory explanation of the mechanism involved. If two fluids of different molecular concentration are separated by a semipermeable membrane, the difference of osmotic pressure on the two sides of the membrane produces a tendency to equalize the concentration in both fluids. If the molecular concentration in the fluid behind a detached retina is lower than in the vitreous fluid an exchange of fluid from the subretinal space into the vitreous space is theoretically possible, diminishing the volume in the subretinal space and increasing the volume in the vitreous space. The result would be a relative approach of the retina to the original position. This principle was applied when in the preoperative era hypertonic salt solutions were administered subconjunctivally, the sclera serving as a semipermeable membrane. It was, however, not generally recognized that the effect of the injection of hypertonic solutions outside the sclera was attributable to their hygroscopic properties. Wessely[9] is of the opinion that the reactive hyperemia of the intraocular (choroidal) vessels plays a more important part in the process. That the production of an inflammatory process in the choroid is essential to the development of adhesions between the reattached retina and the choroid has become commonly accepted. Whether this is done with cauterizing chemicals or with the diathermic needle is of lesser importance. It is, however, generally agreed that in all cases of considerable elevation of the detached retina it is necessary to bring the retina into closer contact with the choroid by draining a considerable amount of subretinal fluid either before or during or immediately after the cauterizing procedure.

There seems to be no doubt that the subretinal fluid contains certain toxic substances that can cause severe irritation of the uveal tract. Birch-Hirschfeld[10] injected subretinal fluid, previously withdrawn with a syringe, into the vitreous body of the same eye and frequently observed a reactive iridocyclitis such as never occurred when a neutral isotonic solution was injected. In untreated cases we fairly often see develop a more or less severe uveitis that is usually attributed to the toxic reaction of the subretinal fluid itself. Whether the secondary cataracts often observed in cases of retinal detachment of long standing are caused directly by that toxicity or result from the chronic uveitis is still an open question. At any rate the fact that the subretinal fluid contains substances capable of producing inflammation seems to be well established.

Deutschmann[4] believed that the thera-

peutic result obtained by injecting rabbit vitreous into the human vitreous body was entirely caused by the process of swelling of the foreign material and that the resulting expansion in the vitreous body pressed the retina back into place. Generally speaking, the good results obtained with the modern methods seem to indicate that our main objective must be drainage of the subretinal fluid and occlusion of the retinal hole or holes, and the combination of these two processes with a reactive inflammation in the eye serves to produce solid adhesions between the retina and the choroid.

Concerning the case here reported, all explanations of the favorable end result rest, I admit, on mere conjecture, since I am in the dark in respect to a number of facts. Entirely unknown is the cause of the first blindness suffered in the patient's left eye in connection (as he thinks) with the abdominal operation in 1925. Whether he had a first retinal detachment at that time is mere guess-work, since the eye was not examined. It is even not impossible that the left eye had been practically blind for sometime without the patient's realizing it and that he detected the visual defect accidentally upon covering his right eye. It is fairly safe to assume that the detachment in the winter of 1942 and 1943 was a direct result of the preceding cataract operation. The anterior synechiae of the pillars of the iris coloboma, the subsequent ingrowth of epithelium into the anterior chamber, and the contours of the scar of incision at the limbus seem to indicate that the operation had been somewhat complicated. It is not exactly known how long after the operation the detachment took place, but probably at least several weeks later.

A hole was not found in the retina, but this does not mean that there had been no hole. A mild chronic uveitis probably had persisted for a number of months and was still present when I saw the patient first, about 7½ months after the cataract had been removed. The eye was very hypotonic. Not quite three weeks later a glaucomatous attack of short duration occurred. The tension became normal within 36 or 48 hours and has remained normal ever since. The exact time when the retina became reattached cannot be determined. The total reattachment was found 2½ months after the attack of glaucoma. If there was a causal connection between the two events it must be assumed that during the short attack of glaucoma that followed extreme hypotony the intraocular pressure in the vitreous body squeezed out the subretinal fluid through some kind of leak and pressed the retina against the wall of the globe. There it was retained by adhesions arising from the inflammatory uveal process, which probably was also responsible for the hypotony found in that eye at the time of my first examination. However, I was not successful in finding such a leak. Nor does the assumption of the presence of a retinal hole afford any help. An open hole in the membrane separating one fluid from the other would represent a communication between the two fluids and would allow free exchange from one side of the membrane to the other, according to common hydrostatic laws. It has been supposed by Leber[2] and others that a flap of retinal tissue sometimes serves as an operculum or valve permitting fluid to escape in one direction—that is, from the subretinal space into the vitreous—but not in the opposite direction. However, the existence of such a mechanism has not been positively proved. The only fairly plausible explanation that remains is a difference in viscosity between the subretinal and the vitreous fluids. The less viscous subretinal fluid may have been allowed to escape through lymph spaces (or by absorption?), the

very sudden rise of intraocular pressure serving as a *vis a tergo*. An acute swelling of the vitreous body as a whole could probably produce a *vis a tergo*. That thereupon the reattachment did not at once manifest itself subjectively is quite understandable, since the retina required some time for functional recovery. That the retina stayed in place is likewise imaginable, since the mild uveitis persisted for a while after the attack of glaucoma, at least for a sufficient length of time to produce the necessary adhesions. After having accomplished that task the inflammation gradually faded away, since the irritant agent formed in the subretinal fluid had disappeared. Normal exchange of intraocular fluid, and with it normal tension, was then established. Nevertheless it is surprising that the function of the retina returned practically to normal after a lapse of at least five or six months during which the retina lacked the necessary contact with the pigment epithelium and choroid. Whether the condition will be permanent or only temporary is another question which has little to do with the problem of causation. At the present time (December 14, 1943) at least the left eye is still behaving like a normal aphakic eye.

Summary

Total detachment of the retina in an eye of a man of 80 years followed intracapsular extraction of a hypermature cataract. The detachment persisted for several months, the eye being practically blind for that period. The eye contracted an acute attack of glaucoma of short duration, and subsequently the retina became completely reattached with full restoration of function including visual field. A causal connection between the occurrence of the glaucoma following a severe hypotension, on the one hand, and the subsequent reattachment, on the other, is assumed.

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NOTES, CASES, INSTRUMENTS

MOTILITY CLINIC

PARESIS OF THE RIGHT SUPERIOR RECTUS MUSCLE*

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Miss J. C., aged 20 years, was first seen 6 months ago. Her history gave no background of ocular disease or anomaly in the family. She herself had never been seriously ill; her mother, however, had noticed that from babyhood the patient's eyes had a tendency to turn out, particularly when she was tired. She had not been troubled much with her eyes nor had she ever worn glasses. Close work brought on eye fatigue which had become pronounced in the past year, during which the patient had done exacting close work. If, in spite of the ocular fatigue, she persisted in such work she would develop severe frontal headaches. Her physician had advised her to give up this work, but loath to relinquish it, the patient had come for consultation and possible treatment.

Visual acuity uncorrected was 20/15 in each eye. Refraction was: R.E. +0.50D. cyl. ax. 180°; L.E. +0.50D. sph. External examination and examination with slitlamp and ophthalmoscope disclosed no pathologic changes.

DIAGNOSIS

Neuromuscular examination. Inspection revealed nothing abnormal except a somewhat larger lid fissure on the right side. Movements of the eyes were free in all directions save one. No excess nor deficiency of the rotations was present *except* when the patient looked *up and to the right;* then the right eye appeared to lag behind the left.

This behavior would indicate the presence of a paretic condition in the right eye, suggesting a *weakness of the right superior rectus muscle,* for that muscle has its maximum elevatory effect in an abducted position of the eyeball.

Cover test (prism and cover test or screening test). The patient was seated before the tangent screen in the middle of which was a small light, which she was asked to fixate. There was no deviation; the patient, therefore, had binocular fixation.

Fusion was now interrupted by covering one eye for a few moments to see whether any appreciable movement occurred after the cover was removed and the eye resumed fixation. Upon removing the covering from the right eye a marked *inward* and slight but noticeable *upward movement* of that eye occurred. The test was repeated on the left eye, whereupon an *inward* and *downward* movement of that eye was apparent.

In the primary position of the eyes, the patient had thus been found to have an exophoria and a left hyperphoria. In order to measure the magnitude of the heterophoria, loose prisms, base out, and loose prisms, base up, were placed in front of the right eye. Base in 20$^{\Delta}$ and base up 8$^{\Delta}$ were required to offset the movement in the cover test.

Next the *double-image test* was performed by placing a dark-red filter first in front of the patient's right eye. The filter excluded everything from the field of vision of that eye except the light in the center of the tangent screen, which appeared red. The left eye continued to fixate the white light. The patient at once indicated the presence of diplopia. She saw the white light in the center of the screen, the

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red light to the *left* and *above* the fixation light; from her statement it appeared that the distances were 10 arc degrees in the horizontal and 4 arc degrees in the vertical direction. Crossed diplopia indicated exophoria; vertical diplopia above the horizontal plane with the right eye covered indicated left hyperphoria; the figures obtained in the subjective measurement of the diplopia coincided with those resulting from the cover test and it could be assumed that the patient had *normal retinal correspondence.* The cumbersome screening test in the secondary and tertiary positions of gaze could therefore be omitted and the much simpler double-image test used.

The red glass was kept in front of her right eye and the patient was asked to keep fixating the light while her head was turned to the left, the right, down, up, down and left, down and right, up and left, and up and right, and to report in each of these positions of the head the position of the red double image. The result follows:

	Up and Right	Up	Up and Left	
	15° Exo 6–7° LH	10° Exo ¾° LH	4° Exo No H	
Right	10° Exo 6–7° LH	10° Exo 4° LH	4° Exo ½° LH	Left
	4° Exo 3° LH	6° Exo 3° LH	3° Exo 3° LH	
	Down and Right	Down	Down and Left	

In the table recording the patient's answers, the findings in the primary position of the eyes are blocked out by heavier lines; the notations indicating the secondary and tertiary positions denote the direction of the gaze; the amount of deviation is indicated in arc degrees.

Beginning with the hyperphoria, an analysis of the figures indicated that there was a left hyperphoria which increased when the patient looked to the right and to the right and up; it decreased when she looked up, to the left, and particularly when she looked to the left and up. In the whole lower field of fixation there was an equal amount of left hyperphoria which was somewhat smaller than in the primary position.

At first glance these findings did not seem to be characteristic of a paresis of a particular muscle, but experience was called upon to help in their interpretation. It will be recalled that on inspection the right eye seemed to lag in moving up and to the right. This is the direction in which the right superior rectus acts most strongly as an elevator, and a weakness of that muscle would be suspected. From the double-image test it was learned that the vertical separation of the double images—that is, the vertical separation of the eyes—was indeed larger when the patient looked up and to the right than it was in the primary position. But the separation of the double images was just as great when the patient looked to the right in the horizontal plane, and an increase in the vertical separation of the double images would certainly be expected when the patient looked up, if an elevator muscle were involved. Instead, there was a decrease in the separation of the double images. Furthermore, this separation was not much smaller in the lower field of fixation than in the primary position, a factor which also would seem to argue against the affection of an elevator muscle.

In view of these findings, could a paresis of the right superior rectus muscle still be considered? In answering this question it was to be remembered that the imbalance had not been a recent one, but was inveterate, probably congenital. Hence it was not to be expected that evidence of a recent superior-rectus paralysis would be found in a patient who had had this condition for 20 years. During this period a twofold healing process had taken place: one, the improvement of the action of the affected muscle; the other, a secondary contraction of the antagonist. Both processes tend to transform the paralytic deviation into a concomitant one.

An analysis of the hyperphoria from this point of view will bring about a better understanding of the values uncovered in the several tests: The left hyperphoria in the lower field of fixation is to be explained by the contraction of the antagonist; the left hyperphoria in the right upper quadrant was due to the residue of the paresis of the superior rectus which was naturally most marked in that direction; the left hyperphoria in the primary position and in dextroversion could be explained on the basis of a cumulative effect of both components. The fact that there was no hyperphoria in the left upper quadrant was a most convincing indication that the right superior rectus was at fault.

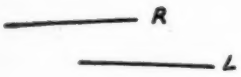
Turning now to the behavior of the exophoria as a possible source of help in solving the problem, it must be remembered that the superior rectus acts not only as an elevator but also as an adductor. If its function is weakened a certain amount of exophoria may be expected. However, the adductive function of the superior-rectus muscle is a secondary one, and the resulting exophoria would increase algebraically the horizontal phoria which the patient had prior to the paralysis. It is therefore impossible to diagnose a superior-rectus paralysis—or that of any vertical motor—from the behavior of the horizontal phoria alone, but the latter may be a helpful diagnostic adjunct.

In this patient the exophoria decreased in the lower field of fixation. This is a physiologic occurrence—exophoria decreases normally in looking down and increases in looking up. This patient also showed an increase in looking up, but only in looking up and right. In the upper left field of fixation—and, indeed, in the whole left half of the field—the exophoria decreased markedly; and this is not physiologic. It is quite probable that a good deal of the exophoria was a result of weakened action of the superior rectus, and the behavior of the exophoria supported the theory of a paresis of the right superior rectus.

In addition to its action as an adductor, certain other secondary functions of the superior rectus muscle remained to be investigated. One was its torsional action. The superior rectus is an intorter; that is, its isolated contraction would induce an inward rotation of the upper pole of the eyeball. In contradistinction to its function as an elevator, the torsional action is greatest in adduction. If the action of the superior rectus muscle is weakened, an *outward* torsion of the eyeball results, and the double images of a horizontal line will not appear parallel but convergent. The *tipping* of the double image pertaining to the eye with a paretic vertical muscle is always *in the direction in which an isolated contraction of that muscle would rotate the horizontal meridian of the eyeball.* In the case of a right superior-rectus paresis, the double image of a horizontal line pertaining to the right eye should be tipped down at the left; it would appear to converge at the left toward the double image of the horizontal line per-

taining to the left eye.

In this respect the patient's eyes behaved as follows: In the primary position the patient had single binocular vision; but when her head was turned so that she looked up and to the right toward a horizontal strip on the wall, she saw the strip double. She stated that one strip was considerably higher than the other and shifted to the left, and that the two strips were a little closer together on the left side. Upon covering her right eye it was found that the upper image belonged to the right eye. What she saw appeared somewhat like this:



The patient's head was turned now so that she looked up and to the left; whereupon she saw the two double images very much closer together, but the upper image tipped much more than before:

This behavior of the double images of a vertical line definitely confirmed the diagnosis of a right superior-rectus paresis. Even when a paresis has become largely concomitant, the characteristic tipping of the double images of a horizontal line can always be uncovered.

Finally, the effect on the vertical deviation of tilting of the head toward the shoulders was to be observed. When her head was tilted toward the left shoulder while the patient fixated the light on the tangent scale, there was little if any vertical deviation of the eye, even if fusion was interrupted by occluding one eye. But when her head was tilted to the right shoulder, a vertical divergence immediately became noticeable. This action again conforms with the conditions in a paresis of the right superior rectus muscle. The right superior rectus is a levotorter; that is, it coöperates synergistically with the other levotorters in straightening the vertical meridians of the eyes when the head is tilted toward the right. Since its action in that position was absent, the equilibrium of the levotorters was upset and a hypertropia resulted. In tilting the head to the left shoulder the levotorters are not called into action and there was no hypertropia.

Therapy

The diagnosis of *inveterate paresis of the right superior rectus muscle* having been established, the question of therapy arose. Resection of the superior rectus appeared to be the best and only course to pursue. The paresis was not marked, and a good functional result could be expected. On the whole, an operation on the superior rectus has its complications. Its fascial connections with the levator generally cause a narrowing of the lid fissure after resection or an enlargement after recession. In this particular case, however, and for reasons that were not apparent, the lid fissure was slightly wider on the right side, whereas, as a rule, it is narrower when there is a weakness of the superior rectus. It was therefore believed that a careful resection might be performed in the expectation of achieving even good cosmetic results.

The operation was accomplished without incident, and the immediate postoperative result showed the desired overeffect. The day after the operation there was, in the primary position, a right hyperphoria of 5 to 6 arc degrees with 8 to 10 arc degrees of exophoria, which amounted to an immediate postoperative effect of 9 to 10 arc degrees. In the whole field of fixation there was a right hyperphoria which increased, as was to be ex-

pected, in looking up and right, where it was as much as 8 arc degrees.

The overeffect decreased rapidly, and 10 days after the operation the patient showed, in the primary position, only 2 arc degrees of right hyperphoria with 4 to 5 arc degrees of exophoria. One month after the operation the right hyperphoria in the primary position had completely disappeared and was only slightly evident in elevated and abducted positions of the eye. The exophoria was also considerably reduced.

Five months after operation the patient reported that she had gained 10 pounds since the operation, that she had never felt better, and that she could engage in any amount of close work without the slightest discomfort. It was now, in her opinion, "fun to study."

The lid fissures are now equal in width, and the patient has binocular fixation for distance. The *cover test* disclosed that when the eyes had been dissociated for a considerable length of time there was a certain amount of exophoria —about 8Δ—but no hyperphoria. As to the double-image test, the results are tabulated as follows:

	Up and Left	Up	Up and Right	
	2° Exo No H	Orthophoria	Orthophoria	
Left	2–4° Exo No H	4° Exo ½° RH	2–4° Exo No H	Right
	Orthophoria	Orthophoria, at times sl. Esophoria	1° Exo No H	
	Down and Left	Down	Down and Right	

These findings show that the vertical-muscle imbalance has entirely disappeared; in addition, and this is interesting, about two thirds of the exophoria has also disappeared. This confirms the original assumption that the patient's exophoria was at least in part due to the weakness of the superior rectus. There is no longer a diplopia in any part of the field of fixation, and therefore the rotational behavior of the horizontal double images cannot be tested. There is no difference in the position of the eyes in the head-tilting test. Stereopsis, tested with the graduated Keystone DB6 chart, was found to be 100 percent.

An ideal operative result, such as was achieved in this patient, cannot be expected to ensue in every case. This case is discussed mainly to show that the operative result confirmed the preoperative diagnosis of a weakness of the right superior rectus muscle.

SOCIETY PROCEEDINGS

EDITED BY DR. DONALD J. LYLE

COLLEGE OF PHYSICIANS OF PHILADELPHIA

SECTION ON OPHTHALMOLOGY

February 18, 1943

DR. ALFRED COWAN, *chairman*

MALIGNANT EXOPHTHALMOS

DR. A. S. CRANDALL reported the case of a white man, 48 years old, who developed increasing exophthalmos beginning one month after undergoing thyroidectomy for Graves's disease. Proptosis increased to such an extent that exposure keratitis was imminent, and visual acuity dropped to 20/400 in each eye. A Naffziger operation was done on one side and a Shugrue operation on the other side, but without benefit. He was also given desiccated thyroid and stilbestrol, without benefit. He improved markedly following pituitary irradiation.

The second case was of a white man, aged 33 years, who developed progressive exophthalmos seven months after thyroidectomy for diffuse toxic goiter. Following treatment with desiccated thyroid, stilbestrol, and pituitary irradiation, the exophthalmos remained stationary, conjunctival edema cleared, and vision improved.

The third case was observed in a colored woman, aged 45 years, who had an exophthalmic goiter and developed rapidly increasing exophthalmos and decreasing vision. After treatment with potassium iodide, stilbestrol, and pituitary irradiation, the exophthalmos remained stationary and vision improved.

Malignant exophthalmos has been shown to be due to edema of the orbital tissues. The edema was caused by a hormone from the anterior lobe of the pituitary gland. Sex was another factor. Good results were reported by treating with roentgen irradiation of the pituitary gland and orbits combined with the administration of desiccated thyroid and estrogenic substances.

Discussion. Dr. E. Rose said the term "malignant exophthalmos" implied the possibility that some malignant process was responsible for the exophthalmos; whereas such was usually not the case. "Progressive exopthalmos" would be a better term.

Ginsberg, in 1939, cited 45 different writers who had advanced theories—some of them duplicating others—in an effort to explain exophthalmos. Some of those theories were fantastic and extremely bizarre: the result of an excessive amount of vitreous; excessive deposits of retrobulbar fat; extreme congestion of the vessels of the orbit; and variations in size of the sphenoidal fissure.

One of the most prominent theories, apparently for a number of years, was the one involving hypertonus of the muscle of Müller. This received support from the fact that in certain experimental animals it was possible, with considerable regularity, to produce exophthalmos by stimulation of the cervical sympathetics; and it was shown a number of years ago by McCallum and Dandy at Johns Hopkins that stimulation of the cervical sympathetics no longer produced protrusion of the eyeball in dogs whose Müllerian muscles were transversely cut.

However, the muscular fibers in the Müllerian muscle in man were not nearly so well developed as they were in some of the lower animals, such as the dog; and the results of an experiment by Friedgood and Cattell, in Boston, tended further to disprove the theory that the cervical sym-

pathetics had anything to do with exophthalmos. They stimulated the cervical sympathetics in 9 or 10 patients who were having thyroidectomies for hyperthyroidism, while the neck was open on the operating table. In only one of these patients were they able to demonstrate any protrusion of the eyeball (1 to 2 mm.). In the other seven or eight individuals with hyperthyroidism but without exophthalmos, they were unable to produce any demonstrable increase in the prominence of the eye by stimulating the cervical-sympathetic ganglion. Not all patients lost their exophthalmos after subtotal thyroidectomy.

Soley in San Francisco, and Galli-Menini at the Massachusetts Hospital, in measuring the exophthalmos of a group of patients before and after thyroidectomy, found that very few of these individuals actually showed a regression of the exophthalmos: it either remained the same or got worse. The deceiving factor seemed to be the loss of the increased tone of the muscles of the upper lid, which often caused disappearance of the retraction of the upper lid after thyroidectomy, and thus gave the false impression that the exophthalmos had receded; whereas careful measurements did not bear this out.

In this type of exophthalmos, the offending organ seemed to be the pituitary rather than the thyroid; and probably the anterior part of the pituitary in some way not yet fully understood, produced a something, a secretion or a factor, which seemed to have this ophthalmotropic effect which Dr. Crandall mentioned. This produced the changes in the retrobulbar tissues of the orbit which, combined with the relaxed tension of the extraocular muscles, resulted in forward propulsion of the eyeball.

This process could stop spontaneously at any point. Friedgood, who had written one of the best reviews of the entire subject, believed that this exophthalmic process could be divided into a reversible and irreversible stage. The reversible stage was that stage in which the protrusion of the eyeball was the result of edema of the retrobulbar structure. If that edema subsided, the eyeball receded into the orbit; thus explaining the fact that many patients with exophthalmos who die lose their exophthalmos soon after death. They probably had edema which disappeared after death. In life, after a certain length of time this edema was replaced by round-cell infiltration, producing a brawny induration of the structures; then the exophthalmos had reached the irreversible stage.

They must be very cautious in their interpretation of the results of treatment. So few cases had been treated by the means outlined by Dr. Crandall that they had insufficient data upon which to base any valid conclusion. Medical treatment was still based largely on theory. They irradiate the pituitary on the assumption that it was responsible. They did not know how effective that irradiation was. Next, they sometimes gave desiccated thyroid with the thought that the thyroid would have some inhibitory effect on the anterior pituitary. That again was theoretical endocrine medicine, which might not have sufficient basis in fact. They also gave estrogenic substances, either natural or stilbestrol, because there was experimental evidence to suggest that estrogenic substances had an inhibitory function on the anterior pituitary. Again, they were working on a basis of theory. So he thought they must be very cautious in their interpretation of pituitary results, especially since they know it can stop at almost any given point.

Speaking as an internist interested in endocrine medicine, he agreed with Dr. Crandall that one should approach with

extreme caution operative treatment in thyrotoxic patients in whom the exophthalmic syndrome dominated the thyrotoxic picture. In the face of severe or rapidly progressive exophthalmos, especially if associated with edema of the lids, with chemosis, with congestion of the conjunctiva, and particularly if the thyrotoxic picture be not very severe, they had learned to approach surgery with great caution. If such patients responded in an exaggerated fashion to the administration of iodine, one should be very cautious about employing surgery. It has been pointed out that instead of showing a gradual (10 to 14 days') drift down to normal in the basal rate, some of these patients with the mild thyrotoxicosis associated with severe exophthalmos would show a quick drop in the basal rate to substandard levels.

They might, under such circumstances, as in the third case reported by Dr. Crandall, depend upon iodides or a combination of iodides with X-ray treatment to the anterior pituitary and to the thyroid.

Thus they had learned from these cases a practical lesson in general medicine, and looked forward with interest to the future developments in this field.

Dr. F. H. Adler said that Dr. Crandall and Dr. Rose had shown that in these cases of progressive exophthalmos the proptosis at the beginning of the disease was out of all proportion to the thyrotoxic symptoms. It was extremely difficult for them to judge the degree of exophthalmos in any individual, since the normal readings, varying so much from one patient to another, depended on the physiognomy. Some people had more prominent eyeballs than others, and the only way they could tell in an individual case whether the degree of protrusion was abnormal was by a difference in the measurements of the two sides; or by noting a change in the measurements over a period of time. It has been their experience that these cases show very little evidence of thyrotoxicosis, judged by tachycardia, sweating, tremor, and loss of weight.

Dr. W. E. Fry said that in the first case reported by Dr. Crandall, a Naffziger operation was done on one side and a Shugrue on the other. It had not been the intention in dealing with this patient to obtain a comparison between the effects of the two operations. The Naffziger was done first, and due to technical difficulties it was not possible to complete the operation on the other side. Because of that, another type of operation was decided upon, and the Shugrue was done.

From the measurements, about the same amount of decrease in exophthalmos was obtained with each of the operations, about 2 mm. As could be seen from the figures, the amount of decrease in exophthalmos was much greater under the X-ray and therapeutic treatment.

Vogt-Koyanagi syndrome

Dr. H. Abrams, inspired by the excellent report of Carasquillo in 1942, presented two patients with features of the Vogt-Koyanagi syndrome.

The first patient was a Negro school boy, aged 16 years, who was seen at the Wills Hospital, on January 6, 1943, complaining of pain in the left eye and poor vision. There was no family history of any eye disease or pigmentary changes of the skin or hair. During childhood he had had measles, chicken pox, and mumps, with no complications. In January, 1941, a patch of vitiligo was noted on the right cheek and it gradually spread over the face to involve the right side of the nose and the region of the inner canthus. When the vitiligo reached the lid margins, poliosis was noted. The patient denied any hearing difficulties or tinnitus.

Physical examination revealed a thin male Negro in good general health. An

area of vitiligo was present on the right side of the face, involving a portion of the cheek, the side of the nose, and the inner-canthus region. The inner one third of the upper and lower lids had patches of vitiligo and contained pure white cilia. Visual acuity on admission was: R.E. 6/5; L.E. 6/60 (Snellen). There was moderate circumcorneal injection; numerous deposits on Descemet's membrane; many floating, vitreous opacities, and marked retinal edema, especially surrounding the disc. The macular area could not be clearly demarcated. One month later, visual acuity was unchanged. Examination with the biomicroscope revealed many old pigment granules on the posterior surface of the cornea, with some endothelial disturbance between the granules. No cells were noted in the deep anterior chamber. There were some areas of pigment on the anterior capsule of the lens along the pupillary border. The urinalysis, blood chemistry, blood Wassermann, and Mantoux tests were negative.

The second patient was a white laborer, aged 21 years, who complained of failing vision and pain in the right eye. Three weeks after the onset of pain the eye became red and irritable; photophobia and lacrimation were constant. One week later, he noticed the cilia of the inner half of the right upper lid had turned white, and they subsequently fell out. Tinnitus was present for a short time.

Examination revealed a well-nourished, nervous type of individual. Visual acuity when first seen was: R.E. 6/12 with and without glasses; L.E. 6/12 without and 6/9 with glasses. There was a patch of vitiligo on the skin of the upper right lid at the lid margin, and finely pointed white cilia at the margin of the inner half of the right upper lid. Ocular examination revealed a phlyctenularlike keratoconjunctivitis, accompanied by an anterior uveitis, corroborated by examination with the biomicroscope. When the uveitis had quieted down and most of the white lashes had fallen out, the visual acuity was: R.E. 6/12, improved to 6/9+3 with correction; L.E. 6/12, improved to 6/9 with correction. The only residual manifestations were vitreous opacities and fine pigmentary deposits on the anterior lens capsule, in addition to the white cilia and area of vitiligo.

He believed that since these patients manifested the same symptoms, that is, uveitis with poliosis, vitiligo, alopoecia, and dyscousia, as reported by Carasquillo, although to a milder degree and unilaterally, they should be classified in the group of the Vogt-Koyanagi syndrome.

Discussion. Dr. A. Cowan remarked that this syndrome was first described by Vogt. Later, a number of cases that had already been reported were collected and, with about six cases of his own, were reported by Koyanagi. It seemed awkward to have to say uveitis with vitiligo, deafness, and alopoecia. So that probably, since Vogt was the first one to describe the syndrome, there might be some justification in naming it "Vogt's syndrome;" but he would like to ask Dr. Abrams why he had added the name of Koyanagi.

Papilledema in acute disseminated lupus erythematosus

Dr. W. H. Steele gave a brief outline of the pathologic picture of acute disseminated lupus erythematosus, and also presented an outline of the fundus lesions found in association with this disease. The following case was presented: A white woman, aged 20 years, was admitted to the hospital on January 3, 1943. Two months previously, following a cold, she had been admitted to another hospital with a diagnosis of facial erysipelas. A course of sulfonamides was started and after a few weeks the patient was dis-

charged. Immediately after discharge there developed a succession of fleeting joint pains, malaise, and dyspnea. Temperature on admission was 104°F.; blood pressure 100/60. Physical examination showed a red-brown indurated skin lesion in a "butterfly area" of the face; signs of consolidation at the bases of both lungs, and enlarged heart with friction rub. The patient gradually developed pericardial, pleural, and peritoneal effusions, with hepatomegaly, respiratory embarrassment, and periods of semiconsciousness. Neurologic examination was normal. A lumbar puncture on two occasions showed increased cerebrospinal fluid pressure.

Ophthalmologic examination showed mild conjunctival injection. Examination of the fundus of the right eye showed blurred disc margins, hyperemic discs elelated 4 diopters, moderate peripapillary edema obscuring vessels and containing many large, white, fluffy exudates with flame-shaped hemorrhages and dilated veins. The fundus of the left eye was similar to that of the right. Frequent examination failed to show any change in the fundus picture. The patient died 10 days following admission.

Discussion. Dr. W. E. Fry stated that his interest during the last few years had been in observing the variety of cases that presented a papilledema as an important ocular feature, and he thought this was one that could be added to the list. The papilledema was definite. It measured 4 to 5 diopters, and associated with it was an increased spinal-fluid pressure. That, to him, was the interesting feature of this case, although there were others that would be interesting from another point of view.

Malignant melanoma of the choroid

Dr. G. M. Johnson reported the case of a white truck driver, aged 42 years, who entered the Wills Hospital clinic on June 20, 1942, complaining of a painful red left eye. He gave a vague history of pain in the left eye one year before but no history of halos. A week before he had pain in the left eye which kept him awake at night. He had some teeth extracted on June 15th and following this he claimed that the left eye had become more painful. The family history was noncontributory.

Examination of the right eye showed a moderately shallow anterior chamber, otherwise normal. In the left eye the conjunctiva was chemotic and markedly red. The cornea was slightly hazy, the anterior chamber obliterated, the iris atrophic and bulging forward. The pupil was fixed, measured 4 mm., and cast a greenish reflex. The lens was hazy and the vitreous was obscured. Marked photophobia was present. The vision in the right eye was corrected to 6/6; the vision in the left eye was perception of hand movements at 12 inches, and the light projection was good. The tension in the right eye was 17 mm. Hg (Schiötz) and in the left eye 66 mm. Hg. The diagnosis was acute congestive glaucoma.

On June 22d an Elliot trephining was done. The following day the conjunctiva was chemotic and red, and the tension was very high to palpation. On June 24th there was less chemosis, but the anterior chamber was shallow and the eyeball was hard as a rock. On June 27th a Frost Lang enucleation was performed. The recovery was uneventful.

Pathologic diagnosis was malignant melanoma of the choroid, spindle cell type B, glaucoma stage; choroidal, subchoroidal, and subretinal hemorrhage with detached choroid and retina.

The case was presented because it was so typical. The sudden onset of unilateral hypertension unrelieved by glaucoma surgery, with atypical visual fields, suggested neoplasm.

Discussion. Dr. E. B. Spaeth commented that apparently he had difficulty in learning some things, because this was the third time that the same situation had happened to him; that is, wherein the patient had been admitted with an acute inflammatory glaucoma and the underlying malignancy was undiagnosed.

The first of the three was an acute unilateral congestive glaucoma of high degree in an eye which was operated on by an iridectomy shortly after the patient's admission. The following day the tension was just as high as it had been the day before. For some unknown reason he presumed that it was a case of hemorrhagic glaucoma. An enucleation was done and an undiagnosed malignancy was found.

The second instance was in a man considerably older than the first of the two, who was admitted with an acute congestive glaucoma, and who was treated conservatively for one or two days. An iridectomy was done under general anesthesia. The cornea cleared up, in that instance, at the time of the operation, but the tension did not recede. It was perfectly remarkable to place a spatula upon the eye and find it as hard as it had been before the anterior chamber was opened. The patient had the barest of light reflexes in the superior nasal portion of the fundus. They thought in this case also there was a huge subchoroidal hemorrhage. The next morning the eye was enucleated and an undiagnosed malignant melanoma was discovered.

The third case was rather classical except that the eye was a bit more congested than was the case in the other two patients. It could be considered a subacute congestive glaucoma. The diagnosis of the malignant melanoma was not made until after the enucleation; the enucleation being done because the glaucoma did not respond to surgery.

These three cases emphasized one thing; namely, that unilateral glaucoma of high degree, in the absence of any preexisting history, and regardless of the fields of vision found, can well be caused by an unsuspected intraocular malignant melanoma.

Dr. M. Blair said that he had had an experience similar to that of Dr. Spaeth, five cases in which malignant hypertension caused him to do, first, an iridectomy for the relief of pain, and, ultimately, an enucleation because the iridectomies made matters infinitely worse and subsequent biopsies revealed melanosarcoma of the choroid. The eye in one of the five cases in particular developed metastatic sarcoma of the liver and the patient lived less than five months from the date of the enucleation of the eye.

The difficulty they had is that they get these cases too late. An early diagnosis would mean earlier enucleation and less danger of metastasis; also less embarrassment for the surgeon, who could determine the nature of the situation by transillumination.

Glass-blowers' cataract

Dr. G. J. Dublin reported glass-blowers' cataract as a rare condition, particularly at the present time when glass manufacturing is done almost exclusively by machinery. The condition might also be present where excessive heat was used in processing metals, as noted in sheet millmen, tin-plate workers, blacksmiths, and so forth. The etiology of the condition had been claimed to be physical, as heat or excessive sweating, which precipitates some aqueous substances; or by infrared- and ultraviolet-ray light. A textbook description of this entity was recounted, setting forth the period of onset and the frequent association with senile cataract in its early stages, particularly in that this latter complication would mask

the early symptoms of glass-blowers' cataract.

A differential diagnosis of glass-blowers' cataract from senile saucer-shaped, complicated, and traumatic contusion cataract was given. A detailed description of the case of a glass blower, aged 82 years, with bilateral involvement was offered. Particular attention was called to the fact that the most pathognomonic finding of this condition was lamella separation. Three types of this separation were noted and a description of each with the various diseases with which each was associated was given.

Discussion. Dr. A. Cowan said that Dr. Dublin's case was the first he had ever seen in a glass blower. He had seen one in a puddler, one in a laborer, and another in a carpenter. He agreed with Dr. Dublin; he could not see how anyone could diagnose the onset of glass-blowers' cataract by the signs similar to the ordinary types of cataract. If they studied these cases, it seemed to him that it was obvious that the anterior zonular lamella did cover the entire anterior surface of the lens. In capsular, cuticular cases, erosion evidently started behind the iris, and in most of them the central portion remained intact, while in the glass-blowers' type, the separated zonular lamella remained a homogeneous, transparent, more or less intact membrane.

He had never seen a place that would indicate a break, and it always seemed that if the separated membrane were extended it would go down below the lower border of the pupil. The break must take place out near the equator of the lens. In one, the anterior zonular lamella was eroded, whereas in the other there was a separation of a more or less intact zonular lamella. It was probable that heat, while it might be a factor, was not the whole cause of this condition.

Dr. M. Blair thought that something constructive might be done by using Shahan's electro-thermophore experimentally on the cornea of animals, recording the effects of the traumatism of heat of varying intensities and varying lengths of exposure to such temperatures. Or, even better, to duplicate the actual conditions that men work in, as far as the workers before white heats were concerned. These men, even though presumably protected by cobalt glasses, formed a very large percentage of those afflicted with cataract, and he could hardly be convinced that glass blowers could escape the results of similar exposure, especially if the exposure were continued over many years.

Dr. I. Tassman stated that the question arises as to how much indirect traumatism entered into the production of cataracts. In these cases, Dr. Dublin implied that the cataracts were not typical and might also occur among people who were engaged in other occupations, as well as among glass blowers, furnace workers, and others. Would not indirect traumatism play some part in the production of this particular type of cataract? He did not know how much blowing a glass blower must do today, but in years past, they probably did a great deal, which might have caused considerable increase in the pressure and distension within the eyeball, and led to an indirect traumatism to the lens. He did not believe the question of heat in its relation to the production of cataract had ever been definitely settled. He thought that some years ago it was shown by actual experiment that the temperature in the neighborhood of the crystalline lens was not increased as the result of exposure of the eyes to extremes of heat, most of which was absorbed by the iris acting as a screen. There must be another important factor that was concerned in the production of these cataracts.

Warren S. Reese,
Secretary.

COLORADO OPHTHALMOLOGICAL SOCIETY

February 20, 1943

Dr. James M. Shields, *presiding*

Pigmented nevus

Dr. William M. Bane presented the case of L. S., a 21-year-old student nurse, who had come to the Out-Patient Clinic of the Medical School. She stated that seven years ago her attention was called to a brown spot at the outer edge of the cornea of her left eye which extended onto the white of the eye. This spot had not been noticed previously. Since that time it had not grown larger nor had it changed in appearance. She experienced no discomfort. The vision was normal in each eye with and without glasses.

The appearance was that of a flat pigmented nevus at the outer limbus, with irregularly shaped dots of pigment scattered throughout the superficial layers. There were pigment spots in the adjacent cornea also. The case had become of interest from the standpoint of treatment. The patient wished to have the spot removed and the question arose as to whether it would be safer to leave it unmolested or to excise it. In either case the possibility of its developing into a malignant nevus had to be seriously considered.

Unusual change in refraction

Dr. William M. Bane reported a case of unusual change in refraction which occurred between June 1, 1942, and February 19, 1943, when the last examination was made. The changes consisted of fluctuation in the apparent hyperopia in the right eye only, the amount of hyperopia in the left eye remaining unchanged. The patient was a 66-year-old woman. On June 1, 1942, the following prescription was ordered: R.E. +0.75D. sph. ⊂⊃ +0.25D. cyl. ax. 180°; L.E. +0.75D. sph. ⊂⊃ +0.12D. cyl. ax. 175°. The vision was 5/4 in each eye with these glasses. Examination of the eyes showed no structural abnormalities.

On October 13, 1942, the patient stated that the vision in the right eye had been blurred for six weeks. The findings were: R.E. +1.50D. sph. ⊂⊃ +1.00D. cyl. ax. 5°, vision 5/5. A thorough physical examination was negative.

On October 22, 1942, refraction was R.E. +2.25D. sph. ⊂⊃ +1.00D. cyl. ax. 30°, vision 5/5−2. On November 5, 1942, refractive error was R.E. +4.50D. sph. ⊂⊃ +0.50D. cyl. ax. 90°, vision 5/5+. Studies of the visual fields on the tangent screen showed no defect.

The findings on December 31, 1942, were R.E. +1.50D. sph. ⊂⊃ +0.50D. cyl. ax. 180°, vision 5/5+. X-ray examination of her teeth revealed nothing abnormal. On February 19, 1943, refraction revealed R.E. +2.00D. sph. ⊂⊃ +0.25D. cyl. ax. 170°, vision 5/7−2. There had been no change in the refraction of the left eye.

No pathologic change in the media or fundus had been observed at any time with the pupil dilated, except a floating shred seen at this examination. There must have been a cause for this unusual phenomenon, but up to the time of the last examination it had not been found.

Contrecoup contusional fundus injury

Dr. R. W. Danielson presented the case of H. S., a 12-year-old boy, who had been struck in the right eye, one month previously, with a BB shot from an air gun. The shot had struck at the limbus, lacerating the conjunctiva and had produced a complete hyphemia. An X-ray picture was negative for shot either in the orbit or in the surrounding soft tissues. As the blood was absorbed from the anterior chamber a considerable amount of

blood was seen in the vitreous. When last seen, the blood had practically become absorbed, and a view of the fundus was obtained. There was a marked fibrotic stellate lesion in the macula, such as is frequently seen in contusional injury. The interesting additional feature was the finding of a profuse number of multisized irregular areas of pigment nasal to the disc. These also were undoubtedly due to the contusion. The vision was less than 20/200.

CONGENITAL REMAINS IN VITREOUS

DR. R. W. DANIELSON presented the case of a 38-year-old laborer whom he had had the opportunity to see only briefly. The man had complained that for the past two weeks his right eye had been slightly red and that he had noticed some floating spots. He stated that as late as 1940 he had qualified as an expert marksman with his right eye. At this time his vision was 20/60 in the right eye. Examination showed a faint opacity of the posterior capsule of the lens. To the nasal side in the vitreous was a round highly refractory yellowish-white disclike mass to which was connected some fibrous tissue. There did not seem to be any connection between the lens and the mass, nor the head of the optic nerve and the mass. An X-ray examination for radio-opaque foreign body was negative. It was concluded that this mass represented a congenital remains which in fetal life might possibly have been fastened to the posterior surface of the lens.

QUESTIONABLE RETINITIS PROLIFERANS

DR. JOSEPH TSCHETTER presented the case of M. W., aged 49 years, who came to the clinic because of blurred vision of the left eye of one year's duration.

Examination of the eyes showed that the vision was R.E. 20/20; L.E. 20/100. The vision was unimproved with lenses. The tension in each eye was normal. Physical examination was negative. Fundus examination of the left eye showed a whitish, funnel-shaped area in the upper quadrant of the retina with many newformed vessels extending outward into the vitreous.

Walter A. Omart,
Secretary.

LOS ANGELES SOCIETY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

February 22, 1943

EPIBULBAR TUMORS

DR. HAROLD F. WHALMAN demonstrated by kodachrome slides a series of epibulbar tumors from the point of view of differential diagnosis and critical treatment. Emphasis was placed on melanoma and the epithelial growths, papilloma and epithelioma.

He referred to recent literature on melanosis of the conjunctiva, particularly the publication of Dr. A. B. Reese, pointing out that acquired melanoma usually had at least five years of premalignant existence before becoming sarcomatous. Hence the history of these cases was important and early removal of small melanomas desirable. Generalized melanosis was not amenable to treatment except exenteration, if the growth were increasing rapidly.

Dr. Whalman pointed out that papilloma might arise in small limbal hyperplasia or pterygia and could not be distinguished clinically from epithelioma except for the tendency to pedunculate. He stated that the cornea and sclera offered resistance to the penetration of epithelial cells, but there was nevertheless invasion to some extent in both instances. Both conditions were treated in the same manner; namely, by sharp excision followed by radiation with radium needle.

Radium penetration could be easily controlled to prevent injury to the lens and subsequent cataract formation and resulted in little scarring and corneal opacity. He felt that it was insufficient simply to excise the growth, for recurrences were common with papilloma and certain with epithelioma when irradiation was omitted. He said removal by cautery was acceptable and that the heat penetration was sufficient to destroy invading epithelial cells, but more scarring and opacity were likely to result.

Discussion. Dr. William A. Boyce said that in his experience cautery excision of the epithelioma had been satisfactory.

Tuberculous uveitis

Dr. Paul V. Yingling (by invitation) gave a review of tuberculosis of the eye. He described all the well-known conditions and the present conception of treatment particularly with reference to tuberculin therapy.

Discussion. Dr. Harold F. Whalman referred to the recent publication of Dr. C. Alan Woods who found a high percentage of cases of chronic uveitis on a tuberculous basis.

Drs. Clarence Albaugh, Samuel Abraham, George Landegger, William A. Boyce, and others discussed the question of establishing tuberculous etiology.

In general, it was conceded that history, clinical appearance, chronicity, elimination of focal infection, complete laboratory studies for syphilis, undulant fever, and plasma, and a fair therapeutic test were all that were available to establish a diagnosis.

Preliminary report on the clinical use of gramicidin

Dr. Eugene Christensen reviewed the status of the new agent gramicidin, its origin, and clinical application. He cited several instances of clinical trial in cases of conjunctivitis, emphasizing the recent epidemic keratoconjunctivitis, which cleared promptly with gramicidin and did not run its usual protracted course.

Dr. Paul Reed presented several instances of the clinical application of gramicidin in conjunctivitis, with quick results.

Discussion. Dr. John Osburn emphasized the ability of discarding the misnomer "shipyard conjunctivitis" in favor of its proper terminology. He said that after all it was not a new entity, that it had been described before, and had been discussed by Col. Robert E. Wright at the Midwinter Course of the Research Study Club of Los Angeles in 1936. It was probably caused by a virus, as already stated by many, as cultures he had taken were negative for bacterial growth.

Harold F. Whalman,
Editor.

AMERICAN JOURNAL OF OPHTHALMOLOGY

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PUBLICIZING THE PROFESSIONAL MAN

The layman and, unfortunately, many engaged in the professions often fail to understand or recognize the fundamental differences distinguishing a professional career from a commercial occupation. Consequently laws, regulations, and practices common to the latter are frequently believed applicable to the former. Since in the near future the public will be called upon to pass judgment on proposed legislation dealing not only with trades, unions, and commerce but with the professions as well, it behooves us as professional men to differentiate our particular problems as clearly as possible and present them to the public so that its opinion may be affected by our point of view.

The first step in this direction must be to define the professional man in terms in which we would like to introduce him to the public. Once we have created a professional prototype that merits the genuine respect and admiration of all, we can hope that doctors will be encouraged to emulate this publicized creation and so gain public confidence to the extent that public opinion in matters pertaining to medical men and medical care

will be but a reflection of their own views.

The old family doctor acquired a position of authority and esteem without resorting to publicity through the fact that everyone in his village knew him intimately and appreciated his adherence to the Hippocratic oath. Today our patients are unable to know their doctors intimately, a hiatus having resulted from modern living conditions, but this can be bridged by a program of education designed to enlighten the layman regarding the professional and ethical requisites of various medical organizations and societies. In this way the public would be taught to recognize the groups, and hence the individuals in the groups who, cognizant of their obligations as professional men, have chosen to abide by certain standards that protect the layman from charlatanism and deficiency in skill. He would not feel a need for further protection by increased governmental activity in the regulation of medical practice.

Primarily the layman must be taught to realize that the professional man who merits admission to the national medical organizations and societies is characterized by two fundamental requisites. First, he must possess special knowledge and training unobtainable except through a rigorous course of education and apprenticeship open to a select few having unusual ability; that is, special knowledge of such value to society that its acquisition is applauded. Second, he must possess a professional philosophy from which is derived a code of ethics governing the manner in which this particular knowledge will be used. The first makes available expert advice and opinion and the second insures that only unprejudiced advice and opinion will be rendered. It becomes the grave responsibility of the societies then, if they are to be effective in shaping public opinion, to censure and debar those doctors who do not possess the professional philosophy.

The professional man, unlike the individual dealing in commerce, has only advice and skill to offer, which, although invaluable at times, are often less tangible than commercial goods and consequently not so readily appreciated. This situation is particularly apparent if the advice or opinion is of a negative nature, as when the doctor, lawyer, or engineer, after long and thorough study, pronounces the "status quo" as satisfactory. The layman has not been educated to value this finding as much as if it were a positive or concrete one, although the knowledge and experience from which the judgment is derived is no less valuable than in cases wherein the finding is positive, and a change in "status quo" prescribed. The negative advice has the same intrinsic value as far as meriting compensation for professional service is concerned. However, those among us who can collect the same fee for not prescribing as for prescribing treatment, whether it be pills or glasses, are rare indeed, although not extinct, and the envy of all. Attainment of such a position implies the ultimate in professional practice and the public's appreciation of it, and should be the goal of professional men.

This goal can be reached only to the extent to which the public realizes that the opinion or advice rendered is expert in that it is in keeping with the best knowledge available at the time and is impeccably free from any considerations other than the findings "per se." Hence our publicized professional man scrupulously avoids any practice that could possibly be construed by the public as biasing his judgment. He cannot profit from the sale of merchandise resulting from his professional advice. He barricades himself against any associations that might imply such profit, as, for example, hav-

ing commercial houses act as his agents. He does not dispense drugs or appliances for the same reason, that in so dealing with merchandise it could be assumed by his patients that his prescriptions might be in excess of the actual need demanded by the medical requirements of the case. It is true that few doctors would care to profit by such practices destined to influence public opinion against their recommendations and generally bring discredit to their profession. Nevertheless, the public is not necessarily tolerant of a doctor's good intentions, and we have to admit that we are faced, from time to time, with scandals such as the recent rebate situation in New York City, publicized by the "New York Times," where the performance of certain doctors, not possessing a professional philosophy, has rendered them and their colleagues vulnerable to a campaign by the public for political investigation and control of medical practice.

In seeking advice or help from professional colleagues, or in referring patients to them, or to laboratories, the professional man uses only those men who, he believes, can do the most for his patient, not those who will do the most for him. He abhors any practice that could be interpreted by patients as jeopardizing this principle. Even though he may rationalize that a referral to a particular colleague who compensates him for the act is in the best interest of the patient, his abstract thinking is sufficiently clear to make him realize that such practices are detrimental to public respect for his profession as a whole and that he must be on guard against these practices, however minor the point at issue may seem to be. He is fully aware of the fact that his authoritativeness and dignity, essential qualities of the true professional man, stem from the inner feeling that he has ministered to his patient to the limits of available skill and ability uninfluenced by considerations of remuneration.

At this point we might pause to realize that we are publicizing this idealized professional man for purposes of capturing and holding public confidence in our group to the end that we may dictate our own destiny without having politicians do it for us.

This professional man is being advertised by us as a group. As an individual he shuns any advertising inasmuch as it could be interpreted as signifying undue interest in material profit from his work or that such interest, rather than the satisfaction of professional attainment and the knowledge of his infleunce in his particular sphere, might be his prime motive. He most certainly could not long retain respect and effectiveness if it were known that he practiced in a way that would bring him the most money rather than in the way that is best for his patient. Our professional man is anxious to do outstanding work and to discuss it with his colleagues so that he can be known to them and admired by them. But at the same time he is sufficiently farsighted and endowed with professional pride and consideration for his colleagues to realize that personal publicity in lay publications sets an example that ultimately defeats the whole scheme of gaining public confidence, because such a practice indicates primary interest in profit for self rather than in benefit for another.

The paragon of virtue that we are promoting may seem too good to be human and practical, and would seem ridiculous in business life. Yet our entire medical tradition, proceeding from the original inspiration of the Cult of Aesculapius, matured into a system of professional ethics made practical by such leaders as Hippocrates, Vesalius, Osler, and Helmholz, has been accepted by the public to the

extent that when John Doe is really ill, or, more important, has an acutely sick child, this quintessence of professionalism is the kind of healer to whom he would like to believe he has entrusted the care of himself or his child. Present trends and practices endanger this tradition and the attendant confidence derived therefrom, and the problem before us is to determine whether or not it is sound, both professionally and economically, to reassert ourselves in a way that will retain and perpetuate this confidence.

It is very true that the public's choice often seems to belie the statement that the layman seeks out the truly professional man, but ignorant, uninformed people make peculiar choices. However, motion-picture producers, whose job it is to appeal to these people in characterizing their hero doctors, realize perhaps better than some of us the spiritual type of man the public wants for its physician. They point the way for us to follow in building up this side of our professional man for purposes of publicity. As a matter of fact, if the public at times makes incomprehensible choice of physicians we can blame ourselves for not having a more active program of public enlightenment. It is the professional man's duty to be active in such a program as a means of furthering public health.

The truly professional man is primarily a student interested in his work and motivated by a desire to be practical in his healing art, scientific in his appraisals, and creative in his attempts to improve and add to the knowledge of his profession. His satisfaction in life comes from these activities. Although he can be financially successful, such success is not attained by prostituting his professional judgment to commercial practices.

This satisfaction is the origin of that certain altruism so characteristic of the publicized "family doctor." It erases all greed and selfishness. It antidotes the possibility of bribery, coercion, or agency relationships, making the private physician as free and independent in action as is possible for any individual to be in our interdependent society.

At this point the question might be raised, why publicize a prototype out of keeping with the modern trends of industrialized and socialized medicine? It is very true that our "to-be publicized" professional man is out of keeping with the planned economy and medicine envisioned in prevalently proposed legislation where independence of thought and action would necessarily be subjugated to considerations of pleasing the directors of such a plan. The physician's incentive naturally would be to please his superiors in the organization rather than to please his patient or himself. In such a plan the physician's responsibility to the patient is often minimized, particularly if free choice of physician is not actually realized. Consequently the patient's detailed care would suffer in proportion to this loss of sense of responsibility. Conscientious men assume responsibility up to a certain point, but when ministration to their patient is so controlled by standardization of procedures that they have no freedom of action in the individual case even the most admirable character will shrug his shoulders and give up.

It is difficult to see how our idealized professional man could survive in a controlled system of medicine that is liable to deprive him of the very virtue for which we value him most—namely, the rendering of expert opinion unprejudiced by any consideration other than the welfare of the patient. Certainly our professional man must champion trends toward improved care for the average patient at lower cost, but the mechanisms by which

these ends are brought about should not lower our standards of professionalism, or we run the great danger of making the pursuit of our profession unattractive to those intellects and free spirits in the future who could contribute most to the advancement of medicine. Publicizing what true professionalism means to the doctor and the patient cannot result in anything but benefit to both, especially now when the public has in mind the much publicized "Kick back" investigation in New York (see Medical Economics, 1944, January).

Scientists above all men value working conditions conducive to free thought and action. The public must be made to realize the value in this, and even though government assumes a more and more important place in medicine the value of private medicine and institutions where action is free of political control must be acknowledged as an absolute necessity for the furtherance of science. A proper comparison would be the valuable influence of private educational institutions in this country where public education is accepted as a matter of course.

Certainly, our ultimate aim in the field of contractural medicine should be to develop systems of contract whereby the intellectual relationship of the doctor to all those to whom he renders his special knowledge should be free from any influence jeopardizing his professional philosophy of unbiased expert opinion, free from bias actual or implied, for, as we have pointed out, every such influence will undermine public confidence in the profession.

We must be on guard against becoming part of any business arrangement or political organization that pays closest attention to the advantages of the moment and ignores the resultant decline in respect and authority upon which the professional man's effectiveness and future contributions for the benefit of mankind ultimately depend.

S. Rodman Irvine.

CONGENITAL CATARACT AFTER RUBELLA IN THE MOTHER

The question as to whether or not this syndrome of congenital cataract, usually associated with other malformations in the offspring of mothers who have had so-called German measles, is something new is a challenging one. That it could have been happening for a long time and have remained undescribed before 1941 is possible but unlikely. The very fact that some 78 cases were described in a community of only a few million people before any cases were described elsewhere is in itself very suggestive of something new under the sun. With the description of three cases by Dr. Reese in this Journal in May there have been many others cropping up in the United States. The writer has seen two certain cases and one probable, and knows of at least one other in Saint Louis in the past three months.

Almost everyone will recall the epidemic of mild measleslike eruptions with slight fever that swept our country in the spring and summer of 1943. It was so mild that most people were not confined to bed with it and many undoubtedly had the disease without even being aware of the fact. The crop of defective children in pregnant mothers who were afflicted is only now coming to light. It seems most probable that a new virus—or a modification of an old one—has travelled across the world, as have disease epidemics for centuries past, and left these sad little derelicts in its wake.

Those patients that the writer has seen have been very miserable little specimens.

They were badly underweight, averaging about 10 pounds at 7 to 9 months, cyanotic because of their serious heart conditions, and with very feeble tenures on life; so poor indeed that in one case the baby died not long after a needling of the second eye. A whiff of ether had been given for each operation and though this was not thought to have been responsible in any way for the death 24 hours after the second, it was decided to use nothing but local anesthesia in the next case. This was very simply done, with apparently no discomfort to the infant. Noteworthy is the fact, also commented on by Dr. Reese, that two of these babies were very intolerant to even very small doses of atropine. One drop of 0.25 percent caused a temperature rise of from 2 to 4 degrees with marked flushing. That it was the atropine was confirmed by a repetition of a similar event when the drop was used in the second eye of the first child and in one eye of the second child. The reaction to atropine, however, is only one manifestation of an unstable heat-control mechanism, because these patients not only developed high fever from minimum doses of atropine, but also in response to other stimuli, such as the temperature of a very hot day. Probably there is a lesion of the heat-control center.

The cataracts have all been of the same type—nuclear. At operation it was easily possible—as suggested by Dr. Reese in conversation—to tip the opaque nuclei into the anterior chambers with the knife-needle and cut them into small pieces after which they were rapidly absorbed.

It behooves ophthalmologists everywhere to be on the lookout for this condition and for some of those who have facilities for so doing to conduct investigations of the possibilities of reproducing this disease in monkeys, but most important to advise that every precaution be taken to prevent exposure of pregnant women to infection with this rubella or rubellalike disease.

Lawrence T. Post, M.D.

BRITISH OPHTHALMOLOGISTS AND OPTICIANS

Many criteria may be found for gauging a nation's progress in civilization. One of the most important criteria is the degree of development of the science and art of medicine. An effective argument might be made out for grading populations by the extent to which refractive errors are corrected.

In some countries the extremes of wealth and poverty are so great that, although the eyes of the favored few receive excellent care, and although extreme errors of refraction are given fairly adequate attention in the public clinics, the vast majority of men, women, and children know little of the benefit and comfort to be derived from correction of moderate amounts of hyperopia, myopia, and astigmatism.

In at least one European country, generally regarded as in the forefront of civilization, the law has denied to the dealer in optical goods all right to measure a customer's refraction. It may be suspected that this fact has hindered, rather than stimulated, the medical practice of refraction. In the United States, on the other hand, and in various parts of the British commonwealth of nations, nonmedical refractionists have obtained a large measure of public recognition and have become numerically significant. In this large group of English-speaking communities, refractive technique and patronage have reached their highest development.

The controversy as to the relative merits and abilities of medical and nonmedical refractionists is constantly with us and has been the subject of many bit-

ter fights in parliaments and legislatures. In the United States, the constitutional privileges of separate state governments have resulted in widely varying standards of optometric regulation. The optometrist has won legal recognition throughout the country, yet for the most part his educational status is fearfully and wonderfully neglected. Only in a few areas is anything like a university basis of education for the optometrist required, and it is in those areas that a fairly rapid advance in the standards of optometric practice may be anticipated.

In Great Britain, the centralized form of government has favored a considerably more uniform treatment of the optometric problem, the better class of "sight-testing opticians" being usually diplomates of one or other of the two leading optical organizations, namely the British Optical Association and the Spectacle-makers' Company.

The British government has recently announced its intention to establish a comprehensive health service for everybody in Great Britain. ("A National Health Service," the British government's eighty-five page pamphlet, has been reissued in the United States by The Macmillan Company.) This proposal, with regard to which the government invites frank criticism and discussion by various sections of the community, has naturally given rise to British medical criticism somewhat similar to that accorded to the Wagner-Murray-Dingell Bill in the United States.

The Council of the British Medical Association, whose president, Lord Dawson, has described the government project as "a genuine statesmanlike endeavor to meet an extremely difficult position," has issued a report on the government scheme (British Medical Journal, 1944, May 13, page 643). The Association has prepared a Draft Scheme for a National Eye Service, and the Council of British Ophthalmologists has appointed a subcommittee to consider this Draft Scheme. The British optical profession has appointed its own "Beveridge Report Committee."

British ophthalmologists are especially interested in the question of their status as consultants under the proposed law, and some guidance as to this relationship will undoubtedly be derived from professional experience with consultant work under the already existing organization of National Health Insurance.

An article in the British Medical Journal from the pen of an English ophthalmologist (Walker, "The ophthalmic surgeon and the optician," 1944, April 22, page 560) argues that the sight-testing optician should be retained and utilized, under the proposed National Health Service, by giving him a position subordinate to, but coordinated with, the activities of the ophthalmologist. ("On receiving his diploma," says this writer, "the optician will become a medical auxiliary.") Walker is apparently disposed to allow the refractive error to be measured by either the ophthalmic surgeon or the optician, "according to the nature of the case or the direction of the surgeon." The optician would naturally undertake frame measurements and arrangements for manufacture and supply of spectacles.

Mr. Walker's proposal has naturally given rise to comments, chief of which is in the form of a long letter from W. B. Barker, Chairman of the optical profession's committee for study of the government scheme.

Although recognizing that ophthalmic optics has a much wider field than refraction alone, Barker regards refraction as "the essential function of the optical practitioner." He remarks that, inasmuch as refraction is "based on the science of

physics and is concerned with the adequacy of healthy eyes, it thus differs from ophthalmology, which is traditionally occupied with disease." He further alleges that the potential value to the community of ophthalmic optics has been "gravely and grossly underestimated by official medicine." This statement may be compared with the accusation frequently made by leading optometrists in the United States, to the effect that the medical profession, and medical licensing authorities, are grievously at fault in permitting the practice of refraction by medical men whose basic medical education gave them no training in the subject.

It is significant that, while Barker is apparently willing to accept, or even to encourage, state control of sight-testing opticians, he is not disposed to tolerate the proposal that his colleagues shall be placed under medical control. He urges that the wide field of public health requires the development of "separate and complementary professions" (namely ophthalmology and optics).

The sort of feud which smolders, and flares up here and there, between the two groups, ophthalmologists and opticians, depends upon two factors: first, a real need for protecting the public against ignorant and unqualified practictioners of any kind; second, economic rivalry. Walker, in the article already referred to, explains the attitude of hostility of some ophthalmologists toward opticians as born of fear and of a reluctance to face facts. "All this fear," he says "is unnecessary, for there is work for all."

"Let any ophthalmic surgeon," he continues, "count how many opticians of all kinds there are in his own district or town, and let him assume that they make a sufficient income to keep their 'shop' open, and then let him remember that under this plan every member of the public needing advice will have to be seen by the 'team'; then having done this, I cannot understand how he can say that there will not be enough work for ophthalmic surgeons, the opticians, and the rest."

Walker, the ophthalmic surgeon, is here of course anticipating the consequences of the plan which he himself proposes for Great Britain. But there is economic sense, and sound regard for public need, in his general willingness to contemplate a division of labor between ophthalmologists and opticians in the same community. The vital necessity seems to be for adequate knowledge and training on both sides, together with complete realization that public interest is paramount to professional selfishness.

W. H. Crisp.

ABSTRACT DEPARTMENT

EDITED BY DR. WILLIAM H. CRISP

Abstracts are classified under the divisions listed below, which broadly correspond to those formerly used in the Ophthalmic Year Book. It must be remembered that any given paper may belong to several divisions of ophthalmology, although here it is mentioned only in one. Not all of the headings will necessarily be found in any one issue of the Journal.

CLASSIFICATION

1. General methods of diagnosis
2. Therapeutics and operations
3. Physiologic optics, refraction, and color vision
4. Ocular movements
5. Conjunctiva
6. Cornea and sclera
7. Uveal tract, sympathetic disease, and aqueous humor
8. Glaucoma and ocular tension
9. Crystalline lens
10. Retina and vitreous
11. Optic nerve and toxic amblyopias
12. Visual tracts and centers
13. Eyeball and orbit
14. Eyelids and lacrimal apparatus
15. Tumors
16. Injuries
17. Systemic diseases and parasites
18. Hygiene, sociology, education, and history
19. Anatomy, embryology, and comparative ophthalmology

1

GENERAL METHODS OF DIAGNOSIS

Agatston, Howard. **Ocular malingering.** Arch. of Ophth., 1944, v. 31, March, pp. 223-231.

This paper, based on the examination of soldiers, is designed not merely to give a list of malingering tests, but rather to present a working classification of ocular malingering.

The author says that in routine Army-induction examinations the incidence of ocular malingering is from 0.5 to 3.0 percent. He quotes Shastid's definition of simulation as the feigning of an ocular disease or injury which does not exist; of false attribution as the assignment of an untrue cause to an existent disease or injury; and of exaggeration as the pretense that an injury or disease which really exists is greater in extent or severity than is really the case. Negative malingering is denial or dissimulation of an existent disease or defect.

These forms of malingering are then systematically discussed under four main heads: (1) errors of refraction, (2) amblyopias, (3) organic diseases, (4) defects in color vision. (3 tables, references.) R. W. Danielson.

Belgrano, C. R. **The oculophrenic-recurrent syndrome in cancer of the lung.** La Semana Med., 1944, v. 51, Feb. 24, pp. 367-370.

In tuberculosis, pupillary inequality and neuralgia or paralysis of the corresponding side of the diaphragm are frequently encountered. The author states that the associated existence of paralysis of the phrenic and recurrent laryngeal nerves is more characteristic of cancer of the lung, especially if occurring on the left side. He describes such a case. (One illustration.)

W. H. Crisp.

Bugnone, Enrique. **Vitamin A, hemeralopia, and the biophthalmometer.** Anales Argentinos de Oft., 1944, v. 4, Jan.-Feb.-March, pp. 6-17.

The author reviews the history of the use of vitamin-rich substances for the treatment of ocular diseases since the time of the ancient Egyptians. He

describes the biophthalmometer and its usefulness in detecting deficiencies of vitamin A. The relation between hemeralopia and the formation of visual purple is discussed and the literature cited. (2 figures, bibliography.)

Eugene M. Blake.

Busacca, A. **A simple and practical method of stereoscopic ophthalmoscopy.** Anales Argentinos de Oft., 1943, v. 4, April-May-June, pp. 47-54.

Busacca has used the corneal microscope and slitlamp for stereoscopic study of the fundus. The contact lens is employed, permitting a clear view of any part of the eyeground. It is possible to differentiate preretinal from retinal lesions, and to study vascular dilatations, the depth of small hemorrhages, changes in the retinal pigment layer, and so on. Eugene M. Blake.

Epstein, B. S. and Kulick, M. **A technique for optic-foramen roentgenography.** Radiology, 1944, v. 42, Feb., p. 186.

In the absence of a Pfeiffer angle device or the adaptation of the Bullitt mastoid localizer, a satisfactory method which will give fairly uniform results is described. A cassette is placed on a 2-inch block, and a cone with a 3-inch aperture is focused so that the central ray passes through the center of the film. The tube and cone are then elevated and the patient, in the prone position, is placed so that the malar eminence, the tip of the nose, and the superior orbital ridge form the angles of a roughly equilateral triangle in the circular roentgenographic field. The superior orbital ridge is then elevated one inch from the cassette and is held in position by a wedge of felt. The central ray is thereby directed perpendicularly downward, passing about ¾ inch mesial to the external canthus of the eye. On the roentgenograms the optic foramina appear as circular structures in the lower portion of each orbit, avoiding the foreshortening and oval shadow frequently obtained with other methods.

An angle-board technique is also described. The physical factors used are as follows: approximately 55 kv.; 50 ma. seconds; cone 7 inches long, with 3-inch opening; screens, par speed. Owen C. Dickson.

Gartner, S., and Lubkin, V. **Eyes from autopsies.** Amer. Jour. Ophth., 1944, v. 27, May, pp. 527-529.

Michaelson, I. C. **Defective night vision among soldiers; dark-adaptation results and their use in diagnosis.** Brit. Jour. Ophth., 1944, v. 28, March, pp. 140-147.

The Koch dark-adaptometer is described and its accuracy in measuring both minimum light and form sense is estimated. The following conclusions are drawn from experimental observations of subjects with and without complaints of defective night vision. (1) The normal minimum light sense and form sense vary, but together they afford a fairly satisfactory measure of individual ability to see in the dark. (2) Cases of defective night vision have poor minimum form-sense. (3) Measurement of minimum light-sense after three minutes dark adaptation does not appear to be of any diagnostic significance. (4) Measurement of minimum form-sense after thirty minutes dark adaptation also appears not to be diagnostically useful. There are indications that poor minimum light-sense is associated with organic disturbance and good minimum light-sense with func-

tional disturbance as the cause of defective night vision. (5) Dark adaptometers which measure only the minimum form-sense have limited usefulness because such instruments give no help in distinguishing between physiogenic and psychogenic defective night vision, and certainly this differential diagnosis is one of the chief problems of oculists investigating defective night vision in large groups of people. (3 figures, 3 tables.)

Edna M. Reynolds.

Nicholls, J. V. V. **Ophthalmology in the R.C.A.F.** Canadian Med. Assoc. Jour., 1944, v. 50, April, pp. 335-338.

Early in the war the "Projecto-Chart" was adopted for measuring visual acuity instead of the Snellen charts. The Maddox rod replaced the red and green box, a color-vision test was adapted from the American Optical Company's color charts by eliminating the less useful plates, and a new color-lantern test is in process of construction. An improved spectacle frame furnished air crews, correcting lenses ing in surface-hardened glass. Sev- new instruments are being made in anada, modelled largely after British instruments. Their details are not mentioned. A small number of patients are benefited by orthoptic training. Night vision is tested with a rotating hexagon, using female ophthalmic assistance which also helps in orthoptic and secretarial work. The organization of the ophthalmic division of the R.C.A.F. is described in some detail. The large unit consists of an experienced ophthalmologist, two to three medical officers under instruction, and three to four female ophthalmic assistants. The small units consist of one ophthalmologist and one female assistant. Where necessary, an optometrist refracts under supervision of the ophthalmologist in charge.

Charles A. Bahn.

Paulo, A., Jr. **Orbital emphysema as means of radiologic contrast.** Rev. Brasileira de Oft., 1943, v. 2, Dec., pp. 85-92. (See Section 13, Eyeball and orbit.)

Raaf, John. **The perimetric diagnosis of intracranial tumors.** Trans. Pacific Coast Oto-Ophth. Soc., 1942, v. 27, pp. 131-144.

The author stresses the importance of field-taking, not only by ophthalmologists but by neurologists, in diagnosing intracranial lesions whenever the patients are mentally and physically able to coöperate, which is in about two thirds of all patients. He notes that none of the fibers of the visual pathways lie in the frontal lobe; and hence that frontal-lobe tumors do not usually produce visual-field defects. This thorough paper is valuable for review of the anatomy of the visual pathways and its study of the field defects produced by intracranial tumors.

Lawrence G. Dunlap.

Sloane, A. E., and Gallagher, J. R. **A practical ophthalmic test which furnishes quantitative data.** Arch. of Ophth., 1944, v. 31, March, pp. 217-222.

The testing of vision as part of an annual medical examination of adolescents is an important procedure, and in the ideal situation would most effectively be carried out by a qualified ophthalmologist. Since such highly qualified personnel is seldom available, one must usually rely on a device designed to screen out persons who would benefit by a more thorough examination. For such purposes the Massachusetts vision test has proved adequate. However, there is a need, under certain con-

ditions, for a visual test which furnishes quantitative data for purposes of classification and yet can be effectively administered by a technician.

In the present report a modification of the Massachusetts vision test is described. The authors' experience with it in testing 797 adolescents is discussed, and its efficiency and the results obtained are evaluated in detail.

The Massachusetts vision test is divided into three parts: first, a test for visual acuity; next, a test for the detection of latent hypermetropia of a substantial degree; last, a test of binocular balance. The authors' technique differs from the Massachusetts vision test in that it provides quantitative measurements of heterophoria and calls for a report on all parts of the test. This modification does not replace the Massachusetts vision test in its sphere of usefulness as a means of screening out children who require further examination of the eyes; but it is applicable only when quantitative visual data are required. (One figure, 2 tables, references.) R. W. Danielson.

Wescamp Irigoyen, R. **The "ophthalmofundiscope"—a simple apparatus for stereoscopic study of the fundus.** Anales Argentinos de Oft., 1943, v. 4, April-May-June, pp. 63-64.

The author couples the objective and ocular of the corneal microscope to study the fundus. A prism is inserted in the ocular to obtain binocular vision, and a small automobile-headlamp bulb with a linear filament gives the illumination. For details of construction one should read the original. The writer claims a clear view of the eyegrounds with his instrument.

Eugene M. Blake.

2

THERAPEUTICS AND OPERATIONS

Alvaro, M. E. **Sulfonamides in ophthalmology.** Rev. Brasileira de Oft., 1943, v. 2, Sept., pp. 2-17.

This is a general review of the effects of the sulfonamides, and of complications arising from them, as presented in the literature. The complications mentioned include edema of the eyelids, transitory myopia and other refractive changes, optic neuritis, iritis, edema of the retina, and retinal hemorrhage. Of 36 recorded cases of transitory myopia, 33 resulted from the use of sulfanilamide and three from sulfapyridine. (Bibliography.)

W. H. Crisp.

Bunakov, V. L. **Blood transfusion in ocular diseases.** Viestnik Oft., 1942, v. 20, pts. 1-2, p. 47.

Bunakov did 52 transfusions on thirty patients. Six cases of optic neuritis and eight of scrofulous keratoconjunctivitis are reported as cured. Of seven cases of vitreous opacity caused by tuberculous cyclitis, three recovered and four were improved. Transfusion was ineffective in one of two cases of optic atrophy and in one of panophthalmitis. It had a favorable effect in two cases of corneal ulcer, and in one of two cases of parenchymatous keratitis. Brief case histories illustrate the effect of this procedure on the course of various ocular lesions. The experience leads the author to the following conclusions: In many severe ocular diseases refractory to orthodox therapy, a blood transfusion may lead to rapid and permanent improvement. It should be used widely in scrofulous ocular lesions and may be helpful in optic neuritis. Transfusion is the only procedure (known

to the author) which stimulates absorption of vitreous opacities.

Ray K. Daily.

Fialho, Abreu. **Studies with the suction cup of Werner Herzau.** Rev. Brasileira de Oft., 1943, v. 2, Sept., pp. 19-27.

This apparatus, consisting of a rubber ball attached to a glass tube carrying a suction cup at its other end, has been used to produce, for therapeutic purposes, an edema of the anterior segment of the eye. The author's use of the cup in a large number of patients produced either negative or indeterminate results. Experiments were made as to the effect of the suction cup in reducing intraocular pressure in cases of glaucoma. Material reductions in tension were produced, but in the secondary rise of tension following the treatment the tension became higher than it had been before the treatment was applied. The author proposes what he calls the suction-cup test for glaucoma, to be applied to prodromal cases. He states that any eye considered normal but which when submitted for five minutes to the action of the suction cup does not undergo a fall in tension at least equal to 50 percent of the original tension must be regarded as preglaucomatous. This determination is further confirmed if the secondary rise of tension, after use of the cup, amounts to approximately 10 mm. beyond the original tension. (4 graphs, 1 illustration.) W. H. Crisp.

Kaminskaja, Z. A., and Tikhomirova, P. E. **The use of short wave in ophthalmology.** Viestnik Oft., 1942, v. 20, pts. 1-2, p. 24.

The authors report briefly on three series of cases treated successfully with short waves, after the usual therapeutic procedures had proved ineffective. One series had postoperative iritis, one had traumatic infections, and the third had purulent keratitis. The results were particularly good in postoperative and traumatic iritis, in the pathogenesis of which the important factor is traumatism to the sensory nerves of the iris. That the short waves act on the sensory nerves is indicated by the fact that the relief of pain runs parallel with improvement in the objective symptoms. The therapy is of value in purulent keratitis, on which it probably acts by dehydration of the colloids, in addition to exerting a thermogenic and bactericidal action. In traumatic infection it was ineffective. Ray K. Daily.

Khavin, H. O. **Blood transfusion in traumatic iridocyclitis and other ocular diseases.** Viestnik Oft., 1942, v. 20, pt. 3, p. 31.

Khavin found blood transfusion of value as an adjuvant to the usual therapeutic measures in traumatic and tuberculous iridocyclitis. Six cases are reported to illustrate the favorable effect of the procedure in the relief of pain and absorption of hemorrhage in anterior chamber and vitreous. One case of severe intractable pannus due to trachoma and tuberculosis, having failed to respond to other forms of therapy, improved rapidly after a transfusion. Ray K. Daily.

Kronfeld, P. C. **Indications for paracentesis of the anterior chamber.** Jour. Indiana State Med. Assoc., 1944, v. 37, March, pp. 113-116. (See Section 8, Glaucoma and ocular tension.)

Laval, Joseph. **Anterior-chamber irrigation with sulfadiazine.** Amer. Jour. Ophth., 1944, v. 27, May, p. 527.

McAlester, A. W., and Borley, W. E. **A double-bladed knife for scleral incisions in shortening of the globe.** Amer. Jour. Ophth., 1944, v. 27, June, p. 641.

Medeiros, Jorge de. **Physiotherapy in some phases of ophthalmology.** Rev. Brasileira de Oft., 1942, v. 1, Dec., pp. 63-69.

The author makes rather brief mention of the following therapeutic methods: electrotherapy, ionization, electrocoagulation, and fever therapy.

W. H. Crisp.

Nano, H. M. **New model of blepharostat.** La Semana Med., 1944, v. 51, Feb. 24, pp. 374-378.

The apparatus consists of a rectangular metallic frame, hinged at the middle of each of its long horizontal sides, these horizontal sides being curved so as to permit of close application across the forehead and the lower part of the nose and cheeks, and the short vertical sides resting on the temples and being secured in place by tapes passing around the back of the head. An adjustable speculum whose blade resembles that used for raising the upper lid of a child can be attached to the upper horizontal bar, and another such short speculum to the lower horizontal bar, in such a way as to raise the upper and lower the lower lid, the blades of these two arms being the only obstacles in the operative field. Or the upper lid can be secured to the upper horizontal bar by means of a suture. (8 illustrations.)

W. H. Crisp.

Reeves, R. J. **X-ray and radium therapy in lesions about the eye.** North Carolina Med. Jour., 1944, v. 5, March, pp. 85-87.

Soft beta rays are preferred because of their limited penetration and lesser likelihood of damaging the lens. Irradiation should be considered in inflammatory external ocular lesions which have resisted other therapeutic measures. In vernal conjunctivitis, a 50-percent erythema dose is used. One treatment may afford relief, but usually complete control is obtained only by numerous treatments at two-week intervals. In blepharitis and eczema of the lids, 4 to 5 weekly treatments of 100 to 150r are given. If not cured, another series may be given after a one-month interval. Recent corneal scars are more successfully treated by irradiation. Old scars should be treated for one year or more with small irradiation dosage one to two months apart. In tuberculous disease of the cornea, sclera, and iris, small doses over a two-year period are advised. Epitheliomas of the cornea are frequently radiosensitive. If the lesion is large, enucleation is preferable, with subsequent radium or X-ray therapy. Epithelioma of the lids, if more than a few millimeters in size, should be treated with beta radium or soft X ray. Failures are frequently due to insufficient treatment. Lymphoma and angioma in and about the orbit should be treated by irradiation. For retinoblastomas enucleation is the method of choice. Charles A. Bahn.

Shereshevskaja, L. I. **Short-wave therapy in inflammatory diseases of the eye and its adnexa.** Viestnik Oft., 1942, v. 20, pt. 3, p. 53.

Conclusions are drawn from a laboratory study on rabbits, and from clinical data. Short waves are safe in oligothermic doses. Intensive irradiation can produce immediate damage to the cornea. There is no late injury such

as may develop following X-ray irradiation. Short-wave therapy is no panacea for any disease. It does however shorten and alleviate the course of the disease in corneal ulcers, corneal infiltration, and postoperative iritis. On rabbits a change in the caliber of the blood vessels following irradiation was not demonstrable. In four out of twenty patients the vessels dilated in two to three minutes after the beginning of the treatment, and contracted again immediately after the treatment stopped. In serpiginous ulcer this treatment did not arrest the progress of the ulcer; but when the ailment reached its acme short waves hastened healing. In superficial ulcers and corneal infiltrates the effect of short-wave therapy was very gratifying from the subjective and objective standpoints. The analgesic effect was pronounced in all cases. Postoperative infections were not arrested by this treatment, but it relieved the pain of postoperative iridocyclitis and it hastened recovery in iritis. In phlegmon of the lacrimal sac it was effective only if used very early. In infections of the lid and styes it overcame the process very rapidly.

Ray K. Daily.

Thygeson, Phillips. **Sulfonamide compounds in treatment of ocular infections.** Connecticut State Med. Jour., 1943, v. 7, Nov., p. 746.

Pertinent literature on the use of the sulfonamide drugs in ophthalmology is analyzed in the light of the writer's personal experience with chemotherapy. Most of the details given in this paper will be found in papers previously abstracted in this Journal (1943, v. 26, p. 1233; and 1944, v. 27, p. 197).

Theodore M. Shapira.

3

PHYSIOLOGIC OPTICS, REFRACTION, AND COLOR VISION

Batson, O. V., and Carpentier, V. E. **Stereoscopic depth perception.** Amer. Jour. Roentgenology and Radium Therapy, 1944, v. 51, Feb., pp. 202-204.

Physicians with little or no depth perception can obtain only slight benefit from stereoroentgenograms. Sixteen physicians entering the study of roentgenology were examined by the authors as to vision, refraction, stereoscopic vision, and fusion. Ten had acceptable depth perception (70 percent on stereometric cards). Three more had normal oculomotor and ocular function, but were apparently stereoscopically inert: a short practice period brought them to normal. Of the remaining three, one required ten days and one six months to become stereoscopically acceptable. The remaining physician had not acquired stereoscopic efficiency when this contribution was written. Roentgenologists should be examined stereoscopically, and should be given training if it is needed.

Charles A. Bahn.

Belmonte Gonzalez, N. **The residual astigmatism in the different ametropias.** Arch. de la Soc. Oft. Hisp.-Amer., 1943, v. 2, Jan.-Feb., pp. 56-61.

Residual astigmatism is defined as the difference between the corneal astigmatism as determined by the ophthalmometer and the astigmatism revealed by subjective refraction. It is lenticular and is perhaps caused by tilting of the lens in respect to the visual axis of the eye. The author follows the biastigmatic method of refraction as practiced by Márquez.

J. Wesley McKinney.

Bilostozky, E. M., Ilina, S. A., and Mikhailov, H. M. **The effect of diet on light sensitivity.** Viestnik Oft., 1942, v. 20, pts. 1-2, p. 52.

In a laboratory investigation on the effect of various diets on light sensitivity the following conclusions were arrived at: Qualitative changes in diet react on light sensitivity. It is reduced on a meat-and-dairy-products diet, and to a lesser degree on a vegetable diet. Light sensitivity begins to fall on the second day after changing from a normal meat milk and vegetable diet to a meat and milk diet; on the fifth day it falls to 55 percent of normal. Upon return to a balanced diet it remains low for two days and reaches normal three days later. A vegetable diet also leads to reduced light sensitivity, but the reduction is less marked and normal is reached on the third day after restoration of a balanced diet. For integrity of night vision it is essential to watch the diet, which should contain fresh vegetables along with meat and milk products. Ray K. Daily.

Copps, L. A. **Vision in anisometropia.** Amer. Jour. Ophth., 1944, v. 27, June, pp. 641-644. (References.)

Crozier, W. J., and Wolf, E. **Flicker response contours for the sparrow, and the theory of the avian pecten.** Jour. Gen. Physiology, 1944, v. 27, March, p. 315. (See Section 19, Anatomy, embryology, and comparative ophthalmology.)

Crozier, W. J., and Wolf, E. **Theory and measurement of visual mechanisms. 10. Modifications of the flicker-response contour, and the significance of the avian pecten.** Jour. Gen. Physiology, 1944, v. 27, March, p. 287. (See Section 19, Anatomy, embryology, and comparative ophthalmology.)

Girling, W. N. M. **Plastic, molded contact lenses.** Northwest Med., 1944, v. 43, Jan., p. 17.

Among the advantages of plastic molded contact lenses over the older glass-molded lenses are the facts that the plastic is not affected by the tears, that it can be trimmed or tightened, and that it is relatively indestructible. The contact lens has found a field of usefulness in high myopes, hyperopes, and astigmatics as well as in cases of corneal scarring, keratoconus, aphakia, and lagophthalmos.

After making castings of the anterior segment of the globe, with moldite, the author makes conjunctival cultures and determines the pH of the tears. If alkaline, as is the case with staphylococcus or streptococcus infections, the conjunctivas are treated with a sulfonamide preparation until the pH is at or near 7.4. The buffered lens solution is prescribed at a pH of 7.4. The author checks the fit of the finished lens by adding fluorescein to the lens solution and examining for areas of possible contact with the cornea, using a strobolite lamp and the slitlamp.

Benjamin Milder.

Kazdan, L. **The use of a contact lens to improve vision in a seriously injured eye.** The Canadian Med. Assoc. Jour., 1944, v. 50, Feb., p. 157.

This article may be of interest in relation to similar cases resulting from war or from accidents generally. A male patient aged 32 years, first seen in 1939, had suffered the loss of his left eye and the right eye had traumatic aniridia and secondary cataract following limbal rupture, sustained in a

street-car accident in 1931. The patient was wearing a small +10.00 lens fixed behind a pinhole disc in the right half of his eyeglass frame. The vision was 20/50, the field very narrow, and getting about was difficult. The author performed a needling and made a cast of the conjunctival sac. A contact lens with a +10.00 correction was made and was painted black except for a central pupillary area. With this the patient obtained "100 percent normal" vision and a field which enabled him to return to his normal pursuits even to the extent of driving his car.

F. M. Crage.

Lijo Pavia, J. **Myopia gravis. Pigmentation, hemorrhages, and sequelae.** Rev. Oto-Neuro-Oft., 1943, v. 18, Jan.-Feb., pp. 15-25.

After experimental work begun in 1939, in cases of high myopia with fundus pathology, the author claims some beneficial results following administration of vitamin K and synthetic sex hormones. A menopausal individual, a high myope with severe chorioretinal atrophy, papillary excavation, and macular pigmentation, had a subjective visual improvement of the left eye from 1/25 to 1/8, and of the right eye from counting fingers at 0.4 meter to 1/50 (corrected). There was, too, a satisfactory improvement in the fundus picture after the administration of both ovarian and testicular hormones. In another high myope with severe chorioretinal changes including hemorrhages in the retina synthetic vitamin K apparently caused disappearance of the hemorrhagic areas, but visual acuity did not improve. The author has embellished his paper with excellent black-and-white and color retinographs, pictured singly and in panorama. Edward Saskin.

McFarling, A. C. **The clinical importance of refractive errors.** Jour. Oklahoma State Med Assoc., 1944, v. 37, March, p. 96.

A ten-year-old boy was examined for a few seconds with an ophthalmoscope. Following the examination the boy became pale, soon his face muscles were twitching, then he vomited, and finally he fell into a general convulsion. Atropine examination revealed a compound astigmatic error of refraction. The author believes that the peculiar behavior of the child was due to eyestrain. If an irritation is greater in intensity than the minimum required for sensation in the particular nerve cell, then it may radiate and superimpose itself on adjacent neurons. The nuclei of the nerves of the ocular muscles, of the facial nerve, and of the vagus lie beneath the aqueduct of Sylvius on the floor of the fourth ventricle. A constant irritation like eyestrain will radiate to adjacent nuclei and may thus be instrumental in producing such gastric symptoms as were encountered in this case, and when such excitation spreads over a large part of the brain it may result in a convulsion. R. Grunfeld.

Noyes, J. R. **Two unusual symptoms of eye strain.** Laryngoscope, 1942, v. 52, May, p. 376.

A middle-aged woman with deafness and an annoying tinnitus was completely relieved of her "head noises" on correction of a hyperopic-presbyopic refractive error. Proof of the relationship was established by recurrence of tinnitus, first on omitting the glasses for a few days and second upon control of later relapse by increasing her presbyopic addition. Several such cases have since been seen by the author.

Globus hystericus is another symptom which in the absence of abnormal

food and air-passage findings may respond to correction of refractive errors. Two cases are quoted, each in an individual with high-strung nervous system. Both were relieved by adequate lenses. Symptoms recurred later with increasing loss of accommodation, but responded to increased presbyopic correction. Owen C. Dickson.

Pimentel, P. C. **Influence of the ametropias upon character.** Rev. Brasileira de Oft., 1943, v. 1, March, pp. 141-147.

As general tendencies in the myope, the author emphasizes the tendency toward reading and toward manual work, memory of what is read, preference for interiors, concentrated attention, introversion, timidity, tendency to analysis and deduction, paucity of friends. In hyperopes he finds tendency toward sports, memory for what is heard, preference for life in the open air, tendency toward inattention, expansiveness, tendency to inductive reasoning, and abundance of friends. These tendencies, however, are modified by the number of children in a family, the general tendency in myopia being corrected by growing up side by side with brothers and sisters; whereas a hyperope who is the only child and is privately educated tends toward the faults of character more usually attributed to the myope. The basic tendency of a refractive error is also modified by early correction with glasses, the corrected myope becoming less introversive, while the corrected hyperope (and also sometimes the myope) may be affected by the criticism which the glasses provoke among his companions and by the possibility of a changed relationship to sports. W. H. Crisp.

Pino, R. H., and Hultin, G. L. **Treatment of asthenopia nonpathologic and nonrefractive in origin.** Amer. Jour. Ophth., 1944, v. 27, May, pp. 520-523.

Sloane, A. E. **Refraction clinic.** Amer. Jour. Ophth., 1944, v. 27, May, pp. 529-531.

Sloane, A. E., and Gallagher, J. R. **A practical ophthalmic test which furnishes quantitative data.** Arch. of Ophth., 1944, v. 31, March, pp. 217-222. (See Section 1, General methods of diagnosis.)

Sugar, H. S. **Suppression amblyopia.** Amer. Jour. Ophth., 1944, v. 27, May, pp. 469-476. (4 tables, references.)

4

OCULAR MOVEMENTS

Barkwill, B. G. **A review of diagnosis and treatment of 500 orthoptic cases.** Trans. Pacific Coast Oto-Ophth. Soc., 1942, v. 27, pp. 124-130.

The author believes in cutting hyperopic corrections one quarter per diopter and myopic corrections only a total of one quarter of a diopter. For orthoptic training he uses a synoptophore, a telebinocular, and prisms. In prescriptions he uses no lateral prisms and only two thirds of the average near or distance vertical imbalance over one degree and up to six or eight degrees. In amblyopia exanopsia up to the age of 12 years he bandages the good eye five days per week constantly for 6 to 36 months. In discussion it was brought out that orthoptists rather than oculists were doing most of the muscle-training work. A Navy commander stressed the fact that after orthoptic training ceased, the eyes slipped back to their original behavior, especially under conditions of anoxemia and fatigue, and he asked those

present not to give orthoptic training just for temporary relief. Another discusser differentiated between orthoptic training used in cases of muscle imbalance and that used in training squint cases. Lawrence G. Dunlap.

Barnard, R. I., and Scholz, R. O. **Ophthalmoplegia and retinal degeneration.** Amer. Jour. Ophth., 1944, v. 27, June, pp. 621-624. (References.)

Fagin, I. D., Pagel, R. W., and Sand, H. H. **Exophthalmic ophthalmoplegia.** Amer. Jour. Ophth., 1944, v. 27, May, pp. 504-514. (4 illustrations.)

Irvine, R. S. **Increasing the action of a paretic inferior oblique by means of the O'Conner cinch shortening.** Amer. Jour. Ophth., 1944, v. 27, June, pp. 644-645.

Lancaster, W. B. **Duties and training of an orthoptic technician.** Amer. Jour. Ophth., 1944, v. 27, May, pp. 515-519.

Ochaporski, S. V. **Etiology of motor paralysis of the eye.** Viestnik Oft., 1942, v. 20, pt. 3, p. 3.

This is a review of the material of the Kuban Eye Hospital for the last thirty years. Among 296,000 ambulatory patients there were 997 cases of paralysis, divided as follows: paralysis of the facial, 295 cases; of the sixth nerve, 282; of the third nerve, 252; of the fourth nerve, 11; of the cervical sympathetic, 2; total ophthalmoplegia, 60; internal ophthalmoplegia, 90; paralysis of accommodation caused by diphtheria, 11; and from other etiology, 4.

In 66 of the 295 cases of facial paralysis, the disease began in childhood. Because of occupational exposure to colds it is more frequent in men. Of 23 patients who had a lagophthalmos keratitis, in two there was also paralysis of the trigeminal; most of these cases were in old people with long-standing paralysis. Three were in children, including a six-month-old infant with congenital paralysis, a seven-year-old child in whom the paralysis followed measles, and an 11-year-old boy with traumatic paralysis. The etiology of the facial paralysis is tabulated as follows: diseases of childhood, 25 cases; infections in adults, grippe and so on, 17; syphilis, 19; brain lesions, 7; arteriosclerosis, 19; trauma to the head or face, 24; disease of the ear, 16; operations on the ear, 22; operations on the parotid, 9; colds, 27; unknown etiology, 110.

The etiology of 282 cases of paralysis of the sixth nerve was: syphilis, 124; diseases of the brain, 39; cranial trauma, 20; infectious diseases, 19; spinal puncture, 21; congenital, 2; tuberculosis, 2; sinusitis, 1; unknown, 49. The frequency of sixth-nerve paralysis following spinal anesthesia led Russian surgeons and gynecologists to abandon this form of anesthesia.

The etiology of 243 cases of isolated paralysis of the oculomotor was: syphilis, 134; nonluetic diseases of the central nervous system, 33; cranial trauma, 20; infectious disease, 14; spinal puncture, 2; congenital, 3; paranasal sinusitis, 1; ptomaine poisoning, 1; unknown, 29. In 17 cases there was an isolated paralysis of the internal rectus. In cases of oculomotor paralysis there were also frequently other symptoms of disease of the central nervous system.

Of the 11 cases of trochlear paralysis, 3 were due to brain lues, 2 to operations on the frontal sinus, 1 to traumatism, and in the others the etiology was not determined.

Of 60 cases of total ophthalmoplegia, 40 were luetic, 8 traumatic, 3 caused by nonluetic diseases of the central nervous system, 5 by diseases of childhood, one postoperative.

The cases of internal ophthalmoplegia were all in patients over 16 years of age. Syphilis was the cause in 78 cases, fish poisoning in 2, encephalitis in 1, and in 9 the etiology was not learned.

Unidentified syphilis may have been the cause of some cases classified as of unknown etiology. In the syphilitic cases it was not always possible to determine the status of the disease, or to make differential diagnosis between tabes and neurosyphilis. Paralysis of the third, fourth, and sixth nerves was met but rarely in a large material of acute encephalitis, while paralysis of gaze was frequent. No case of multiple sclerosis was found in this material. In one case paralysis of the oculomotor was the first symptom of a tumor of the nasal sinuses. Ray K. Daily.

Reinhardt, P. H. **Correction of external rectus paralysis with contracture of the opposing internus.** Amer. Jour. Ophth., 1944, v. 27, June, pp. 636-640.

5

CONJUNCTIVA

Campos, Evaldo. **More concerning submucous resection of pterygium.** Rev. Brasileira de Oft., 1943, v. 2, Sept., pp. 29-36.

Reference is made to recommendation of this technique by Edilberto Campos ten years or so ago. The author, and other Brazilian ophthalmologists, appear to have experienced many recurrences after operation upon pterygium by the McReynolds method. The author's description is unfortunately not supported by illustrations. Apparently, after separating the head of the pterygium, he makes traction on this part in the direction of the center of the cornea, cuts across the neck of the pterygium cautiously so as to divide only the epithelial layer and then with scissors dissects away the submucous structures toward the caruncle and upward and downward. He uses no suture. (References.)

W. H. Crisp.

Dosorova, H. I. **Pterygium operation with transplantation of mucous membrane from the lip.** Viestnik Oft., 1942, v. 20, pts. 1-2, p. 59.

The author's technique consists in excision of the pterygium, and covering the exposed surface with a flap of mucous membrane excised from the lip; sutures are used only occasionally, because the flap adheres well without them. In 134 cases there was no recurrence. Dosorova claims that this procedure has in addition a favorable effect on associated conjunctivitis.

Ray K. Daily.

McKee, S. H. **Certain virus diseases of the eye.** Canadian Med. Assoc. Jour., 1944, v. 50, March, p. 261.

Viruses are defined as filter-passing, particulate matter, probably endowed with life, but obligate parasites having definite affinity for specific living tissue cells. The virus diseases listed as of interest in ophthalmology are vaccinia, herpes simplex, herpes zoster, varicella, lymphogranuloma venereum, trachoma, inclusion conjunctivitis, and the recently described epidemic keratoconjunctivitis.

Intracellular inclusion bodies, either cytoplasmic or intranuclear or both, are fairly characteristic of virus infection. Considerable difference of opinion has arisen regarding the interpretation

of what the different parts of the inclusion body actually mean. It is felt that the elementary body in its progress in division swells to form the initial body. This corresponds to young and old forms.

The virus etiology of trachoma and inclusion conjunctivitis has been established by proof of the transmissibility of the disease through the elementary bodies. Staining reactions and relative sizes of the elementary bodies of epidemic keratoconjunctivitis, vaccinia, fowl-pox, psittacosis, and trachoma are almost identical.

Owen C. Dickson.

MacManus, Adeline. **Survey of case notes of phlyctenular ophthalmia.** Irish Jour. Med. Science, 1943, Nov., pp. 611-612.

The writer made an investigation into phlyctenular ophthalmia among all patients who attended the Royal Victoria Eye and Ear Hospital in Dublin during the five-year period 1934-1939. The disease was found in 721 (1.6 percent) patients in a total number of 47,519. As to age incidence 26 percent of patients were preschool and 41 percent of school age, 11 percent adolescents, and 20 percent adults. The female sex was represented in the proportion of 59 percent. Seasonal incidence was: January to March 24 percent, April to June 23 percent, July to September 31 percent, and October to December 21 percent. The affection was unilateral in 74 percent, and in 52 percent of these it occurred in the right eye. In 3.5 percent of the cases the phlyctens were centrally located in both eyes. Regarding exciting causes, it was observed that the disease occurred as a sequel to acute infection in 15 instances, in 42 cases tonsils and adenoids were considered the source of infection and were removed, and in 4 cases septic cervical glands were present. Trauma as an exciting factor was mentioned in eight instances, episcleritis and iritis were present in two cases, eight cases were associated with blepharitis, and four with trachoma. In regard to complications, three phlyctenular ulcers were complicated with hypopyon, and in two cases enucleation was necessary as the ulcer perforated. As to housing conditions, 31 percent of the cases came from slums, 38 percent from the middle class, 6 percent from a more prosperous class, 2 percent in patients living in new flats, and 22 percent were from country places. The writer tabulates the incidence of phlyctenular ophthalmia in connection with the occupation of the fathers of affected children and the occupation of adult patients. He concludes that unemployment or death of the wage earner, and meager income, as probable cause of undernourishment poverty and bad housing, are important etiologic factors in the disease. M. Lombardo.

Morrison, W. H. **Primary diphtheria of the conjunctiva.** Nebraska State Med. Jour., 1944, v. 29, Feb., p. 51.

A seven-month-old girl was brought to the author because she had a copious discharge of pus from the eyelids. The lids were edematous and red, but not indurated. The conjunctiva was injected, the cornea clear. Staphylococci were found in the smear and were cultured from it. Under sulfathiazole ointment, the discharge diminished. Two days later the child vomited. The lids were covered with a gray transparent membrane which could neither be wiped off nor torn away. Diphtheria bacilli were cultured from this pseudomembrane. R. Grunfeld.

Price, D., and MacManus, A. **Report on an investigation into phlyctenular**

ophthalmia. Irish Jour. Med. Science, 1943, Nov., pp. 603, 610.

This report on 140 patients examined shows that 57 were under 5 years of age, 73 between 5 and 15 years, 2 were aged 15 and 1 aged 18. Of these 61 (44 percent). were male. A positive tuberculin reaction was elicited in 138 (98.5 percent) either by the percutaneous or by a secondary intradermal test in negative reactors. Active primary tuberculosis was present in 77 cases (55 percent), and progressive lesions were present in 17 (12 percent). The site of the primary focus in positive cases was: pulmonary, 102; cervical glands, 5; abdomen, 1; middle ear, 1; and in 29 no focus was found. Bone and joints lesions developed subsequently in 7 of the pulmonary cases. Of the 138 cases 72 were found to be suffering from radiologically demonstrable pulmonary lesions, the majority being in the primary stage. Physical examination showed dental defects in 22 percent and unhealthy tonsils in 25 percent, while among 140 cases 7 subsequently developed oseous lesions. In the writers' opinion phlyctenular ophthalmia should be approached from the tuberculosis angle, the eye lesion being merely an incident in the tuberculosis. (References.) M. Lombardo.

Rocha, Hilton. **Primary conjunctival chromomycosis.** Ophtalmos, 1943, v. 3, no. 2, pp. 205-211.

The patient, a 43-year-old merchant, was an enthusiastic hunter, a fact which the author adduces in relation to the statement that chromomycosis usually attacks laborers. In each eye, there were precipitates on Descemet's, and the media generally were hazy. After failure of various treatments including desensitization to tuberculin, biomicroscopy showed in the bulbar conjunctiva of the right eye, close to the transitional fold, two small black points in size less than the head of a pin. Thinking of a parasite, the author excised these two nodules with a small fragment of conjunctiva. With appropriate staining, the pathologist found, beneath an area of conjunctival atrophy from compression, a granuloma, constituted by epithelioid cells and giant cells of the Langhans type, the central area of the granuloma being occupied by a colony of brown fungi. Between the two granulomas, in the lamina propria, was an inflammatory infiltrate, consisting of lymphocytes, plasmocytes, and eosinophiles. The pathologist proposed a diagnosis of conjunctival chromomycosis from Hormodendrum Pedrosoi. Two months later, the pathologist found mycelial filaments of a similar character in pus derived from a verrucous dermatitis of the patient's right foot. This is stated to be the first case of its kind reported in the world literature. (One clinical photograph, 4 photomicrographs.) W. H. Crisp.

Sherman, H., and Feldman, L. **Hypersensitiveness of the mucous membrane. 4. The effect of local reactions elicited by specific and nonspecific excitants upon the ophthalmic mucous membrane in allergic and nonallergic individuals.** Jour. of Allergy, 1944, v. 15, March, p. 77.

When the conjunctiva was stimulated with a nonspecific excitant, histamine, and after three to seven days was restimulated with a specific substance, for instance ragweed, then in 67 percent of the cases an increased vascular response occurred in the form of vascular dilatation. No consistent change in reactivity occurred when histamine was used for the initial excitation and for restimulation, or when

a specific substance was used for the initial excitation. R. Grunfeld.

6

CORNEA AND SCLERA

Berezinskaja, D. I. **Corneal transplantation in chemical burns of the eyeball.** Viestnik Oft., 1942, v. 20, pts. 1-2, p. 19.

This is a detailed report of a laboratory study on rabbits. Their eyes were burned with 10-percent sodium hydroxide or 30-percent sulphuric acid. The transplanted material consisted of cornea of dead rabbits, preserved on ice. The transplantations were made at various periods subsequent to the injury. The data show that after chemical burns the transplant becomes gradually replaced by connective tissue, more rapidly after acid then after alkali burns. The new connective tissue at first surrounds the transplant, then penetrates, and finally replaces it. The formation of connective tissue is preceded by vascularization of the injured cornea; the vessels advance from the periphery, surround the transplant, sometimes invade it. After acid burns the corneal vascularization is more abundant and the inflammatory infiltrate in the transplant and adjacent tissue is more pronounced. This infiltrated and partially necrotic tissue is gradually replaced by newly formed connective tissue. The cornea adjacent to the transplant becomes transparent several weeks after the transplantation, and this effect is attributed to the action of the transplant on the cloudy cornea. The transparency of the cornea following alkali burns is better than that after acid burns; the biochemical processes initiated by the transplanted tissue act better on cornea injured by alkali, because alkalies increase corneal permeability, while acids coagulate the tissue. The data show much more frequent "taking" of the transplant after alkali than after acid burns, and more severe complications in the eyes where the graft failed to take after acid burns.

Ray K. Daily.

Chechik-Kunina, E. A. **Keratoplasty in serpiginous and purulent corneal ulcers.** Viestnik Oft., 1942, v. 20, pts. 1-2, p. 30.

On the basis of laboratory investigations on rats and of clinical experience in 16 cases, the report on which is tabulated, the author concludes that keratoplasty as a therapeutic procedure is superior to a keratotomy or a Zonderman trephining. Keratoplasty leads to fewer synechias and a higher visual acuity. In addition to the favorable effect of trephining, keratoplasty exerts a biologic action on the transplant. That the transplant possesses unusual vitality is indicated by the fact that placed in an infected area it suffers but slight initial infiltration, which rapidly clears up, the transplant then taking. The biologic effect of the transplant manifests itself in rapid resolution of the inflammatory process and restoration of corneal transparency. Pain ceases immediately after the operation, and the inflammatory process subsides. Progressive ulcers are promptly arrested, and within the next few days the cornea becomes clear, the infiltration disappears, the surface becomes covered with epithelium, and the defect is filled in. The resulting opacity is rapidly absorbed.

Considering the severity of the infections, surgical and postoperative complications are few. The unfavorable features of this operation are opacification of the transplant, frequency of anterior synechia, and associated rise in intraocular tension. The results of par-

tial keratoplasty were not satisfactory in this type of ulcer. Ray K. Daily.

Gifford, S. R., Puntenney, I., and Bellows, J. **Notes on keratoconjunctivitis sicca.** Trans. Amer. Ophth. Soc., 1943, v. 41, p. 80. (See Amer. Jour. Ophth., 1943, v. 26, Dec., p. 1343.)

Loewenstein, A. **Herpes corneae and virus infection.** Glasgow Med. Jour., 1944, v. 141, Feb., p. 54.

The author discusses in general virus infection in ophthalmology and corneal herpes in particular. In 1911 Grueter discovered the transmissibility of corneal herpes to rabbit cornea. In 1919 the author was successful in transmitting the contents of the labial herpes vesicle to the cornea of rabbits. His technique was as follows: The blade of a Graefe knife was dipped into the content of a lip vesicle, then two horizontal, not too superficial, corneal sections were made. Forty-eight hours later many delicate vesicles were seen with the loupe along the superficial incisions. Under the slitlamp the lesion appeared as a grayish-white infiltrate. After three days the whole central area was covered with a grayish-white infiltrate and there was an accompanying iritis. The corneal ulcer never appeared dendritic in shape. From this rabbit herpes a second, third, and fourth series of rabbit corneas could be infected. The author proved the existence of very delicate cocci seen with the May-Grünwald-Giemsa stain, but he could not cultivate them. It is now proved that corneal herpes belongs to the filtrable-virus group.

Only the dendritic form, and not the diffuse, patchy, and disciform types of herpetic keratitis, creeps along the nerve fibers. But the ever present hypesthesia cannot be explained otherwise than by damage to the nerve fibers. Febrile herpes is dermotropic, whereas herpes zoster is distinctly neurotropic. In 15 percent of infected rabbit corneas there are seen nervous symptoms, excessive salivation, convulsions, trismus, and paresis of the legs, and death occurs within 15 to 18 days; these effects being explainable as due to herpetic encephalitis. Intracerebral injection of herpes virus leads directly to encephalitis, with all the typical symptoms of human lethargic encephalitis. There exists a generalized varicellar zoster with obvious dermotropic rather than neurotropic properties. One type of ophthalmic herpes zoster, herpetic iritis, is clinically restricted to mesodermal tissue.

Soon after the herpes iridis heals there remains an extensive vitiligo iritis, a circumscribed damage to the anterior layer of the iris. Similar vitiligo is found after chickenpox and after smallpox, another proof that the variola and vaccinia viruses are closely related to the herpes virus. Among other virus infections are: epidemic punctate keratoconjunctivitis, trachoma, inclusion conjunctivitis, molluscum contagiosum, and lymphogranuloma venereum. These examples suffice to stress the importance of virus diseases in ophthalmology. R. Grunfeld.

McKee, S. H. **Certain virus diseases of the eye.** Canadian Med. Assoc. Jour., 1944, v. 50, March, p. 261. (See Section 5, Conjunctiva.)

MacManus, Adeline. **Survey of case notes of phlyctenular ophthalmia.** Irish Jour. Med. Science, 1943, Nov., pp. 611-612. (See Section 5, Conjunctiva.)

Popov, M. Z. **Therapeutic keratoplas-**

ty in purulent corneal ulcers. Viestnik Oft., 1942, v. 20, pts. 1-2, p. 40.

Popov's clinical conclusions are: (1) In the majority of cases keratoplasty arrests the progress of serpiginous ulcer, relieves pain, photophobia and hypopyon, and shortens the period of hospitalization. (2) A thin partial transplant takes very well. (3) To obtain a transparent transplant and rapid recovery from the inflammatory process, it is necessary to resect the infiltrated segment completely. The fact that the transplant remains transparent or becomes but slightly opaque indicates that the cells of the transplant exert a definite influence on the processes of proliferation and regeneration. It impedes the development of cicatricial tissue, which is so abundant in the end result of corneal ulcers. (4) There is a marked contrast between the excellent cosmetic effect (from apparent transparency of the transplant) and the low visual acuity. This is probably due to microscopic changes. (5) Keratoplasty is the most effective therapeutic procedure in the treatment of corneal ulcers. How to keep the transplant transparent is one of the problems yet to be solved. (6) Incomplete keratoplasty is a safer surgical procedure than total keratoplasty, but its visual results are poor. Ray K. Daily.

Price, D., and MacManus, A. **Report on an investigation into phlyctenular ophthalmia.** Irish Jour. Med. Science, 1943, Nov., pp. 603-610. (See Section 5, Conjunctiva.)

7

UVEAL TRACT, SYMPATHETIC DISEASE, AND AQUEOUS HUMOR

Berlin, C. **Behcet's syndrome with involvement of the central nervous system.** Arch. Derm. and Syph., 1944, v. 49, April, p. 277.

From 12 cases found in the literature and from one of the author's own, the main features clinically of Behcet's syndrome are described as simultaneous or separate attacks of aphthous lesions in the mouth and on the genitalia and ocular changes mostly of the character of a hypopyon iritis. The attacks may or may not begin at the same time, the ocular disorder not rarely developing several years later. Additional symptoms are: erythema-nodosumlike lesions (5 cases); acneform or papulopustular eruption (3 cases); furunclelike pyoderma (1 case); hydrops of the knee (1 case); and cerebral symptoms (2 cases). The predominant age is the third decade; men are twice as frequently affected as women; the course is chronic; prognosis poor, as therapy is of no avail and no instance of healing has been recorded.

In the author's reported case, which showed the classic signs of the syndrome with in addition a furunclelike pyoderma, death occurred after a cerebral attack and necropsy revealed small multiple foci of inflammation and softening in the brain.

Theodore M. Shapira.

8

GLAUCOMA AND OCULAR TENSION

Fialho, Abreu. **Studies with the suction cup of Werner Herzau.** Rev. Brasileira de Oft., 1943, v. 2, Sept., pp. 19-27. (See Section 2, Therapeutics and operations.)

Hardesty, J. F. **The use of doryl in glaucoma.** Amer. Jour. Ophth., 1944, v. 27, June, pp. 625-628.

Pokrovsky, A. I. **A modification of**

the Lagrange operation. Viestnik Oft., 1942, v. 20, pts. 1-2, p. 3.

The steps of the operation as done by Pokrovsky are: (1) a conjunctival incision 10 mm. above the limbus, and dissection of the conjunctival flap to the limbus. (2) With a scalpel a scleral incision 7 to 8 mm. is outlined at the edge of the limbus. (3) The incision is extended gradually through the deeper layers of the sclera. (4) With a small cataract knife a semilunar scleral flap is outlined, 2.5 mm. above the incision. (5) This flap is grasped with forceps and dissected obliquely downward toward the limbus, forming a pocket just above the scleral incision. (6) The scleral fibers are carefully cut through and the anterior chamber opened. (7) The scleral incision is completed with scissors. (8) The scleral flap is cut away. (9) Iridectomy is performed. (10) The conjunctival flap is replaced. The merits which the author claims for the procedure are protection of the ciliary body from injury, and consequent absence of postoperative synechia, a flat cicatrix with a thinned sclera, and a subconjunctival fistula covered with thick conjunctiva. (Illustrations.) Ray K. Daily.

9

CRYSTALLINE LENS

Bonfioli, Amelio. **Intracapsular extraction of cataract with sclerocorneal suture.** Ophtalmos, 1943, v. 3, no. 2, pp. 177-186.

The author gives a clear description of his personal technique, with excellent illustrations. The tear sac is washed out with physiologic salt solution. Adrenalin solution is injected subconjunctivally below the lower limbus, to increase dilatation of the pupil in this region and so facilitate grasping the lens capsule near the lower equator. After fixation of the superior rectus, a variation of the Stallard suture is inserted. Starting through the conjunctiva vertically about 6 mm. above the edge of the loosened flap, the suture is inserted in the sclera 4 mm. from the limbus, is brought out 2 mm. from the limbus, is then carried horizontally through the cornea 1 mm. below the limbus, forming a tunnel of about 2 mm. in the cornea, and is finally carried upward, parallel with the downward arm, through the sclera and out again through the conjunctiva. The corneal incision is made with Graefe knife and scissors. The portion of the suture applied to the cornea is used to raise the corneal flap while the intracapsular extraction is performed, the capsule forceps being carried as far down as possible between the iris and the lens. W. H. Crisp.

Halbron, Pierre. **The physiochemical characteristics of the normal and the pathologic crystalline lens.** Rev. Brasileira de Oft., 1942, v. 1, March, pp. 121-139.

This is in the nature of a thesis, and reviews the literature of research with regard to the physical and chemical properties of the crystalline lens, with special reference to the parts played by the following factors in producing lens pathology: calcium and potassium, modification of sugar lipoids (probably more the result than the cause of lens opacity), hydrolysis of the proteins in relation to respiratory disturbances, and acid tendencies of the pH. The author adds a table of the physiochemical characteristics of the lens, and a six-page bibliography. W. H. Crisp.

Rocha, H., and Coscarelli. **Anterior lenticonus.** Ophtalmos, 1943, v. 3, no. 2, pp. 219-225.

In the case reported here, the patient was a white woman aged thirty years. The corneas were regular. In each eye there was a perfectly transparent lenticonus, the skiascopic measurement calling for plus 1.00 sphere at the periphery and minus 10.00 sphere at the center. The base of the lenticonus was 3 to 4 mm. in diameter. There were also a few equatorial opacities of the coronary-cataract type and some filaments of persistent pupillary membrane between the iris and lens. There was no adhesion between the apices of the cones and the posterior surface of the cornea. Conjectures as to the causation are discussed, with brief reference to the literature. (3 illustrations.) W. H. Crisp.

Salit, P. W. **Sugar content of cataractous human lenses.** Amer. Jour. Ophth., 1944, v. 27, June, pp. 612-616. (3 tables, references.)

10

RETINA AND VITREOUS

Anfinsen, C. B. **Distribution of cholinesterase in the bovine retina.** Jour. Biol. Chem., 1944, v. 142, Feb., p. 267. (See Section 19, Anatomy, embryology, and comparative ophthalmology.)

Anfinsen, C. B. **Distribution of diphosphopyridine nucleotide in the bovine retina.** Jour. Biol. Chem., 1944, v. 152, Feb., p. 279. (See Section 19, Anatomy, embryology, and comparative ophthalmology.)

Barnard, R. I., and Scholz, R. O. **Ophthalmoplegia and retinal degeneration.** Amer. Jour. Ophth., 1944, v. 27, June, pp. 621-624. (References.)

Coscarelli, Ennio. **Coats's retinitis.** Ophtalmos, 1943, v. 3, no. 2, pp. 195-204.

After brief preliminary consideration of the subject, the author describes in detail a single case. The patient was a white boy of 12 years. Diminution of vision of the left eye had been noticed for a year or more. This eye was slightly divergent. The anterior segment was normal. The fundus reflex had a greenish tinge. The peripapillary retina had a whitish-yellow color, except in the upper outer quadrant where it was a grayish-green. In the upper and lateral retinal quadrants, yellow areas alternated with dark areas which at many points were almost black. Most of these areas were in the same plane as the normal retina, and were crossed by the clearly visible vessels. In the periphery of the upper outer quadrant, where the fundus had a greenish rosy tint, there was a definite cystic elevation, of the same color. A similar cyst, but less sharply defined, occurred in the upper inner periphery. The vessels had a considerably increased caliber near the disc, but more or less normal caliber in the rest of the fundus. Here and there were seen new-formed anastomotic elevations, the white cords of perivasculitis, and minute scattered hemorrhages. When the patient looked downward, a three-lobed rosy mass became visible, very prominent, and attached in the region of the ora serrata. This mass protruded toward the interior of the eye, occupied the whole inferior quadrant, and even extended into the lateral quadrant. The vessels in the upper region were distended, and generally bordered by yellowish granular bands. The lower region, that of the rosy tumefaction, showed vessels with new-formed capillaries, small hemorrhages, and innumerable small dilatations of a sacular or aneurismic

character. The vision of this eye was limited to counting fingers at about 0.5 meter. The vision of the right eye was normal. Both eyes had normal tension and normal pupillary reflexes. (One color plate, references.) W. H. Crisp.

Michaelson, I. C. **Defective night vision among soldiers; dark-adaptation results and their use in diagnosis.** Brit. Jour. Ophth., 1944, v. 28, March, pp. 140-147. (See Section 1, General methods of diagnosis.)

Stephenson, W. V. **Efficacy of vasodilators in fundus disease.** Amer. Jour. Ophth., 1944, v. 27, June, p. 644.

11

OPTIC NERVE AND TOXIC AMBLYOPIAS

Gomes, Brenno. **External ophthalmoplegia from crotal (snake) poison.** Ophtalmos, 1943, v. 3, no. 2, pp. 187-194. (See Section 16, Injuries.)

Singh, Amarjit. **A case of neuromyelitis optica (Devics' disease).** Indian Med. Gazette, 1944, v. 79, Jan., p. 24.

The author gives the history of one case of this disease, a variety of acute disseminated encephalomyelitis characterized by acute onset of paraplegia and optic neuritis. There is no known treatment. In the author's case, death occurred within one week.

W. H. Crisp.

13

EYEBALL AND ORBIT

Ferreira, J. A., and Austregesilo, Jr. **Syndrome of Claude Bernard Horner.** Rev. Brasileira de Oft., 1943, v. 2, Sept., pp. 39-40.

A single case is recorded by Ferreira, and is commented upon by Austregesilo from the neurological point of view. The patient was a white child aged nine years. The left eye presented moderate enophthalmos and partial ptosis of the upper lid, and there were also heterochromia and anisocoria. As to each eye the visual acuity, twilight vision, chromatic sense, and peripheral visual field were normal. Dilatation of the left pupil under cocaine or atropine was less than of the right. The neurologic examination showed slight facial asymmetry (the left side of the face being broader than the right), scoliosis, flatfoot, hypotrophy of the muscles of the left hand, hypopigmentation of the nipples, and spina bifida occulta.

W. H. Crisp.

Haik, G. M. **Progressive exophthalmos in toxic disease of the thyroid gland.** Arch. of Surgery, 1944, v. 48, March, p. 214.

The treatment of exophthalmos associated with hyperthyroidism, particularly of the variety which becomes progressive after thyroidectomy, has hitherto been unsatisfactory. Thyroidectomy, far from correcting the condition, frequently seems to aggravate it.

Recent studies indicate that the cause of exophthalmos in hyperthyroidism is local edema, sometimes associated with hypertrophy of the extraocular muscles. The proposal that irradiation be substituted for thyroidectomy is based on the theory that with a less abrupt alteration in the endocrine balance there is a greater chance for more gradual readjustment of the optic structures.

A case of progressive post thyroidectomy exophthalmos is reported and is analyzed in the light of these new concepts. It was unusual because

of the extreme youth and the race (Negro) of the patient.

Theodore M. Shapira.

Kendell, A. M., and Krasnov, M. L. **Schüller-Christian disease.** Viestnik Oft., 1942, v. 20, pt. 3, p. 69.

The patient, a woman 43 years of age, with negative family and personal history, developed bilateral exophthalmos and lost her teeth. A few years later she began to suffer from extreme thirst, and eight years after onset of the disease she developed inflammatory symptoms of the left eye with an increased exophthalmos. X ray showed absorption of the bones of the skull, and enlargement of the orbit with thinning of its walls. The long bones were not involved, except for the head of the femur, which was deformed and flattened. Exophthalmos, diabetes insipidus, and loss of teeth established the diagnosis of Schuller-Christian disease. The patient was treated with injections of pituitrin, which relieved her headache, thirst, and diuresis. The exophthalmos remained unchanged, but the inflammatory phenomena subsided and vision improved. Ray K. Daily.

Magnus, J. A. **Orbital cellulitis in a baby, caused by acute osteomyelitis of the maxilla.** Brit. Jour. Ophth., 1944, v. 28, March, pp. 135-138.

The literature is reviewed and the differential diagnosis between osteomyelitis of the superior maxilla and orbital involvement secondary to acute nasal sinusitis is clearly outlined.

A case of orbital cellulitis in a child of two weeks is presented. There was marked edema of the left upper and lower eyelids, with chemosis and proptosis of the eyeball. On the fifth day after admission to the hospital, the child was operated upon. A deep incision was made through the medial part of the left lower lid, down to the bone. A large subperiosteal abscess in the floor of the orbit was opened and a great amount of pus discharged through the opening. A suction apparatus was used frequently to clear out the discharge from the nose and the incision. The proptosis and swelling of the lids subsided within the next four days, and the temperature returned to normal. The incision in the left lid closed except for a small fistula through which a sequestrum appeared four months after operation. The fistula closed after removal of the sequestrum, and nine months after the operation the scar of the left lower lid was scarcely visible and the child was in perfect health. (5 photographs, references). Edna M. Reynolds.

Paulo, A., Jr. **Orbital emphysema as means of radiologic contrast.** Rev. Brasileira de Oft., 1943, v. 2, Dec., pp. 85-92.

Four X-ray pictures, a diagram, and a photograph of the patient illustrate this supplemental means of X-ray diagnosis. The patient, a girl of ten years, had slowly progressive exophthalmos on the left side, and a preliminary series of X-ray pictures had failed to give adequate information. Orbital emphysema was produced by retrobulbar injection of about 7 c.c. of air. The exact nature of the (apparently soft) tumor is not stated. Very little absorption of the injected air occurred within 24 hours, and, to relieve the patient's discomfort, the air was released by puncture of the distended conjunctival sac. It is suggested that the air would be better evacuated as soon as the pictures were made.

W. H. Crisp.

Salter, W. T., and Soley, M. H. **The treatment of Graves's disease with severe exophthalmos.** Med. Clin. North Amer., 1944, v. 28, March, p. 484.

Severe, progressive exophthalmos has been noted most after treatment of hyperthyroidism. Not infrequently, however, this condition may occur during the untreated phase of Graves's disease, making necessary such a measure as supraorbital decompression before thyroidectomy, or irradiation of the thyroid. A small group of patients with Graves's disease will show a persistent and progressive exophthalmos even after adequate treatment of thyrotoxicosis. That hyperthyroidism is only one factor in some cases of Graves's disease is borne out by the finding of a typical Graves syndrome with no hyperthyroid element. It is also suggested in cases in which the hyperthyroidism has been controlled but the Graves's disease persists.

About 40 percent of patients with Graves's disease will show progression of exophthalmos after treatment of their hyperthyroidism. In addition to the usual findings of measurable exophthalmos, photophobia, lacrimation, conjunctival and scleral and occasional lid edema, there may be added diplopia, corneal ulceration, papillitis, and occasional loss of the globe from infection.

Management of exophthalmos is not standardized. One case now reported occurred in Graves's disease without hyperthyroidism, which was controlled by giving large doses of thyroid. The explanation was that thyroid substance inhibited a nocuous pituitary substance, the excess of which was responsible for the exophthalmos. In the presence of mild exophthalmos and hyperthyroidism, irradiation of the thyroid, in three courses of 900 r at 6-week intervals, may be used. In the presence of severe hyperthyroidism, subtotal thyroidectomy is advisable. Any untoward eye symptoms should be carefully watched.

Treatment of the eyes in this condition consists of glasses with side shields for protection, prisms for controllable diplopia, saline eye washes, sulfathiazole ointment for ulceration, suturing of the lids for cosmetic reasons or for corneal protection, and measures to control entropion. Generally papillitis and secondary optic atrophy constitute indications for supraorbital decompression. Exophthalmos preventing closure of the lids is also frequently an indication for decompression. Edema may persist after surgery if it has been delayed too long.

Six to 9 mm. recession of the globe after a temporary postoperative increase in exophthalmos may be expected to follow the Naffziger supraorbital-decompression procedure.

Owen C. Dickson.

14

EYELIDS AND LACRIMAL APPARATUS

Gifford, E. R., Puntenney, I., and Bellows, J. **Notes on keratoconjunctivitis sicca.** Trans. Amer. Ophth. Soc., 1943, v. 41, p. 80. (See Amer. Jour. Ophth., 1943, v. 26, Dec., p. 1343.)

Hazen, H. H. **Dermatitis of eyelids.** Arch. Derm. and Syph., 1944, v. 49, April, p. 253.

Acute or chronic dermatitis of the eyelids is common. It may be due to many causes, the commonest of which are seborrheic dermatitis, cosmetics applied to the face, and irritants transferred by the hands, of which nail polish ranks first. Diagnosis is best made by history, from examination of the hands and face, from results of

patch tests, and from information obtained by elimination of suspected substances. Theodore M. Shapira.

Kurlov, I. H. **A pocket flap for restoration of the lids.** Viestnik Oft., 1942, v. 20, pts. 1-2, p. 12.

The operation is performed at two sittings. In the interim between the two a thin strip of cartilage from the ear is implanted into the flap if it is to be used for the upper lid. The first operation consists in preparing a mucocutaneous flap. An incision 2.5 cm. long is made vertically downward beginning at the outer canthus. The outer lip of the incision is undermined to form a pocket 2 cm. deep. Two parallel incisions are made from the ends of the inner lip of the incision toward the center of the face. There is thus outlined a quadrangular flap of skin, attached at one long end. A piece of mucous membrane from the lip is sutured over the skin with the epithelial surfaces opposed. This double flap is then buried in the previously prepared pocket and held there with sutures. The free end of the mucous membrane is turned over and sutured to the free end of the cutaneous pocket to form the future intermarginal space. The wound is dressed daily and irradiated with a quartz light every other day.

The second operation is performed 15 days later, when the mucous membrane flap has become attached to the outer wall of the pocket. The mucocutaneous flap is cut on a pedicle, to the desired size and form, and is arranged to fill the full thickness defect of the lid. The free end of the mucous membrane is sutured to the remaining conjunctiva of lid or eyeball, and the skin sutures are placed so as to give the flap the contour of the lid.

Ray K. Daily.

Rocha, Hilton. **Molluscum contagiosum.** Ophtalmos, 1943, v. 3, no. 2, pp. 212-218.

With some reference to the literature, two cases are reported. A white girl aged seven years, whose right eye for one month had shown congestion, photophobia, and tearing, had warty elevations, about the size of a grain of rice (with depressed yellow centers) one at the external canthus, one at the outer end of the margin of the upper lid, two on the chin, one on the upper lip, and a half dozen in the left axilla. A diagnosis of molluscum contagiosum having been made, the two nodules on the eyelids were curetted and were swabbed with iodine. There was rapid healing of a corneal ulcer which had existed before excision of the nodules. A young white man aged 17 years had a nodule of the same kind in the right upper lid next to the eyelashes. A sulfonamide was prescribed and the nodule excised. Healing occurred under this treatment, and so the author is somewhat disposed to question his diagnosis. (One clinical photograph, 3 photomicrographs.) W. H. Crisp.

Tikhomirov. P. E. **Diagnosis of epiphora,** Viestnik Oft., 1942, v. 20, pt. 3, p. 34.

This is a detailed discussion of the diagnostic procedures for the etiology of epiphora, with tabulated data of the author's own studies in support of his conclusions. The objective examination consists of the following steps: (1) Inspection of the lids with special attention to the border of the lower lid and conjunctiva, the lacrimal lake, the puncta, and the semilunar fold. (2) The adequacy of the lacrimal canaliculi is tested by instillation of 1-percent fluorescein or 3-percent collargol. If the passages are normal, colored fluid

disappears from the conjunctival sac in one half to two minutes. If this test is negative, the color remains in the conjunctival sac a longer time, indicating disturbance in the function of the lacrimal canaliculi. The action of the canaliculi may be visualized by instilling one to two drops of collargol and immediately illuminating the canaliculi with the slitlamp; the drainage through the canaliculi can be seen as a dark disappearing line. A cotton-wound probe is introduced into the nose two to three minutes after instillation of the stain into the conjunctival sac. The data show that in 85 percent of normal cases the fluid appears under the inferior turbinate within 2 to 5 minutes; only in 14.5 percent of the cases was it delayed for 6 to 10 minutes. (3) If this test is negative and the stain does not appear on the probe, the permeability of the lacrimal passages is determined by probing or irrigation. (4) Stenosis of the lacrimal sac is determined by irrigation; and is localized by X rays with an opaque medium. (5) The examination is completed by examination of the nose, and by search for the cause of functional epiphora, if no organic lesion be found.

The author's investigations lead him to the following evaluation for the canaliculus test; a positive test in one half to one minute indicates excellent suction by the canaliculi; positive within two minutes, good function; delayed to three minutes, impaired function; negative for five minutes, complete lack of function. The test for the presence of colored fluid in the nose is interpreted as follows: Positive within three minutes indicates excellent permeability of the lacrimal passages; after 4 to 6 minutes good permeability; after 7 to 10 minutes, impaired permeability; after 10 minutes markedly impaired permeability; negative for 30 minutes, impermeability. A rapidly positive nasal test is an indication of normally functioning lacrimal passages.

The most reliable method of demonstrating the presence of colored fluid in the nose is to pass a cotton wound probe under the inferior turbinate. The data on Schirmer's test, applied to 46 persons, lead the author to conclude that it is not a reliable criterion of the degree of epiphora. In cases without epiphora the presence of pathology in the nose had no effect on rapidity of lacrimal drainage. Ray K. Daily.

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TUMORS

Baltin, M. M. **Late results of treatment of carcinoma of the lid with Bucky's border rays.** Viestnik Oft., 1942, v. 20, pt. 3, p. 63.

This treatment was effective in 35 cases of carcinoma of the lid, a number of which were under observation for a five-year period. Good results are obtained only in superficial growths. If the neoplasm extends into the intermarginal space and the cartilage, the immediate result is good but there is recurrence usually within a year. In six cases with recurrence the carcinoma extended deeply into the lid. The growth which recurred was much smaller, so that the subsequent surgical procedure was less extensive Irradiation with these rays is indicated as a prophylactic measure after surgical removal. Treatment with fractional doses is better than irradiation with massive doses. No changes in the lens could be demonstrated in any of the cases observed over a five-year period.

Ray K. Daily.

Pertzeva, V. A., and Levkoeva E. F. **Incidence and forms of lid carcinoma.** Viestnik Oft., 1942, v. 20, pts. 1-2, p. 55.

A review of the literature and an analysis of 114 tumors seen at the Helmholtz Institute during a ten-year period. Of these 96 were basal-cell carcinomata, and 17 were spinocellular cancers. One case presented a typical picture of adenocarcinoma. In 80.7 percent of the cases the lower lid and inner canthus were involved; in 19.3 percent the upper lid and outer canthus. Ray K. Daily.

Rocha, H., and Tavares, C. L. **Familial characteristic in retinoblastomas.** Ophtalmos, 1943, v. 3, no. 2, pp. 169-175.

A new familial group of cases is reported by the author. The parents were both Portuguese, there was no consanguinity, and there was no knowledge of cases of ocular tumor in the ascendants and collaterals. Of 11 children five had died, two in consequence of retinoblastoma and three from other causes. Excluding these three, the pertinent facts regarding the other eight children are as follows: Two had died from retinoblastoma after removal of the affected eye. Two, aged respectively eight and four years, had been operated upon for retinoblastoma but were still living. Four, aged respectively 14 years, 11 years, 7 years, and 14 months, were in sound health. In all the affected cases the tumor was unilateral. W. H. Crisp.

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INJURIES

Arruda, Jonas de. **Traumatic fistula of the anterior chamber.** Rev. Brasileira de Oft., 1942, v. 1, Dec., pp. 95-98.

A 17-year-old worker in a pin factory was struck in the right eye with a pin which flew from one of the machines used in manufacture. The pin did not adhere to the eye, and in the absence of pain no further attention was paid to the incident. Six months later the patient consulted the ophthalmologist because it had been noticed that this eye did not see so well as the other. The vision of the right eye was reduced to 1/5, while that of the left eye was normal. Examination of the right eye showed the pupil normal and active. There was a filtrating subconjunctival scar occupying the lower inner sector of the bulbar conjunctiva and extending to the cul-de-sac. The slitlamp showed in the corneal epithelium a dystrophic lesion of the dendritic type. Through the conjunctival ectasia could be seen at the five-o'clock position a limbal opening, dark in color, and through which apparently the aqueous was escaping. There was a funnel-shaped elevation of the iris beneath this opening, and adhering to the limbal scar. The tension of this eye was 3 mm., that of the left eye 6 mm. Incidental changes in corneal refraction caused distortion of the ophthalmoscopic view of the fundus. The surgical intervention employed consisted of turning back a conjunctival flap, releasing the anterior synechia, obturation of the minute limbal opening with a small pedicle flap of episclera, and finally suturing of the fistular tissue, the suture being made to include the sclera. Three weeks later the cornea had its normal aspect, the dystrophic disturbance having disappeared, and the corrected vision of the right eye had risen to 1/2. The tension of the affected eye had risen to 12 mm., and that of the other eye to 16 mm. (References.)

W. H. Crisp.

NEWS ITEMS

Edited by Dr. Donald J. Lyle
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News items should reach the editor by the twelfth of the month

Deaths

Dr. Edgar S. Bell, Chicago, Illinois, died April 17, 1944, aged 75 years.

Dr. Jacob F. Burkholder, Chicago, Illinois, died June 7, 1944, aged 82 years.

Dr. Justus B. Chaffin, San Angelo, Texas, died March 21, 1944, aged 67 years.

Dr. Andrew Christensen, Chicago, Illinois, died April 5, 1944, aged 82 years.

Dr. Eugene Dickenshied, Allentown, Pennsylvania, died April 16, 1944, aged 84 years.

Dr. Robert J. Ferguson, New Haven, Connecticut, died May 15, 1944, aged 72 years.

Dr. Albert E. Fritze, Chester, Illinois, died April 6, 1944, aged 83 years.

Dr. Carl Hamburger, born in 1870, died in May, 1944, in Gland near Geneva, Switzerland. His studies in the physiology of nutrition of the eye, of problems concerning glaucoma were among his most important. His "Theoretical and practical notes on glaucoma" were published in this Journal (October, 1930). Doctor Hamburger practiced in Berlin from 1898 until 1939, when he was forced to leave; he found refuge in Switzerland.

Dr. Ralph A. Hatch, Boston, Massachusetts, died April 1, 1944, aged 62 years.

Dr. Harry M. Ivins, Santa Cruz, California, died March 21, 1944, aged 65 years.

Dr. Charles M. Mooney, Columbus, Ohio, died March 24, 1944, aged 73 years.

Dr. Hans Paulsen, Chicago, Illinois, died April 11, 1944, aged 58 years.

Dr. Edward H. Porter, Tiffin, Ohio, died May 14, 1944, aged 71 years.

Dr. Albert Thompson, Saint James, Minnesota, died March 10, 1944, aged 71 years.

Dr. Arthur D. Whiting, Saint Cloud, Minnesota, died March 19, 1944, aged 71 years.

Miscellaneous

The Leslie Dana Gold Medal, awarded annually for outstanding achievements in the prevention of blindness and the conservation of vision, will be presented this year to Miss Linda Neville of Lexington, Kentucky, it has been announced by the National Society for the Prevention of Blindness. Miss Neville is the founder of the Kentucky Society for the Prevention of Blindness. Selection of the recipient of the Leslie Dana Gold Medal is made by the Saint Louis Society for the Blind, through which the medal is offered by Mr. Leslie Dana of Saint Louis. This highly prized token of recognition in the field of public health is given upon the recommendation of the Association for Research in Ophthalmology.

Societies

A joint meeting of the Reading, Pennsylvania, Eye, Ear, Nose, and Throat Society and the Reading Dental Society was held June 22, 1944. The speaker was Lt. Col. James B. Brown, Chief of the Plastic Center of Valley Forge General Hospital. His topic was "Military plastic surgery" and his talk was illustrated with slides and motion pictures.

At the recent annual meeting of the Florida Medical Association Dr. Shaler Richardson of Jacksonville was chosen president-elect.

Among the speakers at the meeting of the Fifth Councilor District Medical Society held on May 16th in Magnolia, Arkansas, was Dr. Wiley R. Buffington, New Orleans, who spoke on "Certain ocular manifestations resulting from systemic diseases."

Personals

Lt. Col. E. O'G. Kirwan, professor of ophthalmology in the Calcutta Medical College, retired in May, 1944 and, according to a recent communication from a colleague in India, he expects to proceed to America. His address will be: Lt. Col. E. O'G. Kirwan, C.I.E., I.M.S., 800 South West Vista Avenue, Portland, Oregon.

Dr. Kenneth C. Swan, for the past five years connected with the medical department of the University of Iowa, has been made Associate Professor of Ophthalmology at the University of Oregon Medical School, effective July 10, 1944.